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# Five-Year Review Report

## Second Five-Year Review
for the
## Bunker Hill Mining and Metallurgical Complex Superfund Site
## Operable Units 1, 2, and 3
## Idaho and Washington

October 2005

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# Glossary

| | |
|---|---|
| μg/m³ | Micrograms per cubic meter |
| μg/dL | Micrograms per deciliter |
| μg/L | Micrograms per liter |
| μg/g | Micrograms per gram |
| %AIA | Percent acid-insoluble ash |
| ACGIH | American Conference of Governmental Industrial Hygienists |
| Al | Aluminum |
| ALAD | Delta-aminolevulinate acid dehydratase activity |
| AMD | Acid mine drainage |
| amsl | Above mean sea level |
| AOC | Administrative order on consent |
| ARARs | Applicable or relevant and appropriate requirements |
| As | Arsenic |
| ATSDR | Agency for Toxic Substances and Disease Registry |
| AWQC | Ambient water quality criteria |
| BAL | Borrow Area Landfill |
| Basin | The area of land that collects the water runoff flowing to a surface water body. See "Coeur d'Alene River Basin". |
| BBS | Breeding bird survey |
| BCR | Big Creek Repository |
| BDAT | Best demonstrated available technology |
| BDS | Idaho Bureau of Disaster Services |
| BEMP | Basin Environmental Monitoring Plan |
| BLM | U.S. Bureau of Land Management |
| BLP | Bunker Limited Partnership |
| BMP | Best management practices |
| BNSF | Burlington Northern Santa Fe Railroad |
| Bunker Hill Box | A 21-square mile area surrounding the historic smelter area that includes the towns of Kellogg, Wardner, Smelterville, and Pinehurst, Idaho |
| CCC | Citizens Coordinating Council |
| CCP | Comprehensive Cleanup Plan |
| CD | Consent decree |
| CDA | Coeur d'Alene |
| CDC | Centers for Disease Control |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CERCLIS | Comprehensive Environmental Response, Compensation, and Liability Information System |
| CFR | Code of Federal Regulations |
| cfs | Cubic feet per second |

| | |
|---|---|
| CIA | Central Impoundment Area |
| CITU | Certificate of Interim Trail Use |
| CLCC | Clean Lakes Coordinating Council |
| COC | Chemical of concern |
| Coeur d'Alene River Basin | The drainage area of the Coeur d'Alene River in northern Idaho and northeastern Washington. |
| COR | Completion of obligation report |
| CSM | Conceptual site model |
| CTP | Central Treatment Plant |
| CUA | Common use areas |
| cy | Cubic yard |
| dw | Dry weight |
| EFNMC | East Fork Ninemile Creek |
| EE/CA | Engineering evaluation/cost analysis |
| ESD | Explanation of significant difference |
| FDR Work Plan | Flood damage repair work plan |
| FEMA | Federal Emergency Management Administration |
| FERC | Federal Energy Regulatory Commission |
| Flats | Smelterville Flats |
| FPS | Final performance standards |
| FS | Feasibility study |
| GCL | Geosynthetic clay liner |
| gpm | Gallons per minute |
| H&S | Health and safety |
| HDPE | High-density polyethylene |
| HDS | High-density sludge |
| HEPA | high-efficiency particulate air filter |
| HHRE | Human health remedial evaluation |
| HUC | Hydrologic unit code |
| HUD | Housing and Urban Development |
| I-90 | Interstate 90 |
| IBDS | Idaho Bureau of Disaster Services |
| ICP | Institutional controls program |
| ICs | Institutional controls |
| IDEQ | Idaho Department of Environmental Quality |
| IDFG | Idaho Department of Fish and Game |
| IDHW | Idaho Department of Health and Welfare |
| IDPR | Idaho Department of Parks and Recreation |
| IINERT | In-Place Inactivation and Natural Ecological Restoration Technologies |
| INEEL | Idaho National Engineering and Environmental Laboratory |
| IPS | Interim performance standards |
| ITD | Idaho Transportation Department |
| LEMP | Lake Environmental Monitoring Plan |
| LHIP | Lead Health Intervention Program |
| LMP | Lake Management Plan |

| | |
|---|---|
| LNFCDR | Little North Fork of the Coeur d'Alene River |
| LOAEL | Lowest observed adverse effects level |
| Lower Basin | The area of the CDA River Basin in OU3 west of Cataldo to the mouth of Coeur d'Alene Lake. Includes the lower Coeur d'Alene River and associated lateral lakes. |
| $m^2$ | Square meters |
| M&R Plan | Maintenance and repair plan |
| MCC | Motor control center |
| MCL | Maximum contaminant level |
| MCLG | Maximum contaminant level goal |
| mg/kg | Milligrams per kilogram |
| mg/L | Milligrams per liter |
| MOA | Memorandum of Agreement or Mine Operations Area |
| MP | Milepost |
| MSL | Mean sea level |
| N | Nitrogen |
| NAAQS | National Ambient Air Quality Standards |
| NCP | National Oil and Hazardous Substances Contingency Plan |
| NFA | No Further Action |
| NFCDR | North Fork Coeur d'Alene River |
| NPDES | National Pollutant Discharge Elimination System |
| NPL | National Priority List (list of Superfund sites) |
| NTR | National Toxics Rule |
| NRC | National Research Council of the National Academies |
| O&M | Operation and maintenance |
| OSHA | Occupational Safety and Health Administration |
| OU | Operable unit (used to define specific cleanup areas of Superfund sites) |
| OU1 | Operable Unit 1, the populated areas within the Bunker Hill Box |
| OU2 | Operable Unit 2, the non-populated areas within the Bunker Hill Box |
| OU3 | Operable Unit 3, the mining-contaminated areas in the broader Coeur d'Alene River Basin outside of OU1 and OU2, from approximately Mullan, Idaho, west to Coeur d'Alene Lake and depositional areas of the Spokane River in Idaho and Washington State. For study purposes, OU3 was divided into four areas: the Upper Basin (areas east of Cataldo, Idaho, outside the Box), the Lower Basin (west of Cataldo to the mouth of Coeur d'Alene Lake), Coeur d'Alene Lake, and depositional areas of the Spokane River. |
| Pb | Lead (the metal) |
| PCB | Polychlorinated biphenyl |
| PHD | Panhandle Health District |
| $PM_{10}$ | Particulate matter less than 10 microns |
| PPWTP | Page Pond Wastewater Treatment Plant |
| PRPs | Potentially responsible parties |
| PTMs | Principal threat materials |
| QA/QC | Quality assurance and quality control |

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|---|---|
| RA | Remedial action |
| RAD | Response action design |
| RAMP | Remedial action management plan |
| RAOs | Remedial action objectives |
| RAWPs | Remedial action work plans |
| RCRA | Resource Conservation and Recovery Act |
| RD | Remedial design |
| RDRs | Remedial design reports |
| RI | Remedial investigation |
| ROD | Record of Decision |
| ROW | Right-of-way |
| RVT | Removal verification team |
| SACA | Support Agency Cooperative Agreement |
| SAMP | Special area management plan |
| SARA | Superfund Amendments and Reauthorization Act (amended CERCLA in 1986) |
| SCA | Smelter Closure Area |
| SDWA | Safe Drinking Water Act |
| SFCDR | South Fork of the Coeur d'Alene River |
| Silver Valley | The Coeur d'Alene River Valley in Northern Idaho |
| SMC | Stauffer Management Company |
| SMCRA | Surface Mining Control and Reclamation Act |
| SOW | Statement of work |
| SPLP | Synthetic precipitation leaching procedure |
| SSC | State Superfund Contract |
| STB | Surface Transportation Board |
| STORET | USEPA's STOrage and RETrieval database system |
| Superfund | A common name for USEPA's CERCLA program |
| SVNRT | Silver Valley Natural Resources Trustees |
| TBC | To be considered |
| TCLP | Toxicity characteristic leaching procedure |
| TCRA | Time-critical removal action |
| TLG | Technical Leadership Group |
| TLOP | Trail Long-Term Oversight Program |
| TLV | Threshold limit value |
| TMDL | Total maximum daily load |
| TSCA | Toxic Substances Control Act |
| TSP | Total suspended particulates |
| TSS | Total suspended solids |
| UAO | Unilateral administrative order |
| UCFWO | Upper Columbia Fish and Wildlife Office |
| UMG | Upstream Mining Group |
| Upper Basin | The area of the CDA River Basin in OU3 east of Cataldo, Idaho, and outside the Bunker Hill Box. Includes the South Fork of the Coeur d'Alene River and its tributaries outside of the Box. |

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|---|---|
| UPRR | Union Pacific Railroad |
| USACE | U.S. Army Corps of Engineers |
| USBM | U.S. Bureau of Mines |
| USEPA | U.S. Environmental Protection Agency |
| USFS | United States Forest Service |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |
| WDOE | Washington State Department of Ecology |
| WGI | Washington Group International |
| WIC | Woman Infant and Children (Clinics) |
| WSU | Washington State University |
| ww | Wet weight |
| WY | Water year |

# Executive Summary

## Introduction

The United States Environmental Protection Agency (USEPA) Region 10 has completed its second, site-wide review of the Bunker Hill Mining and Metallurgical Complex Superfund Facility (the "Bunker Hill Superfund Site" or "Site") located within northern Idaho, sections of the Coeur d'Alene Reservation, and northeastern Washington. This review was conducted from August 2004 through April 2005. The purpose of this review was to evaluate whether the Superfund remedies that have been or will be implemented at the Site pursuant to Records of Decision (RODs) and other Superfund decision documents are or will be protective of human health and the environment. Projects implemented with Clean Water Act funds were outside the scope of this review.

Reviews of Superfund remedies are required every five (5) years at Superfund sites where hazardous substances remain onsite above levels that allow for unlimited use and unrestricted exposure. This five-year review report documents the methods, findings, and conclusions of this second, site-wide review of the Bunker Hill Superfund Site remedies, and identifies issues found during the review and recommendations to address them.

The text and summary tables in this Executive Summary provide an overview of the second, five-year review report. More detailed information is available in the following sections:

Section 1: Introduction

Section 2: Site Background

Section 3: Review of Selected Remedies for Operable Unit 1

Section 4: Review of Selected Remedies for Operable Unit 2

Section 5: Review of Selected Remedies for Operable Unit 3

Section 6: Findings and Recommendations

Section 7: Statement of Protectiveness

Section 8: Next Five-Year Review

## Site Description

The Bunker Hill Superfund Site was listed on the National Priority List (NPL) in 1983. This NPL Site has been assigned Comprehensive Environmental Response, Compensation, and Liability Act Information System (CERCLIS) identification number IDD048340921. The Site includes mining-contaminated areas in the Coeur d'Alene River corridor, adjacent floodplains, downstream water bodies, tributaries, and fill areas, as well as the 21-square-mile Bunker Hill "Box" located in the area surrounding the historic smelting operations.

The USEPA has designated three operable units (OUs) for the Site:

- The populated areas of the Bunker Hill Box (OU1);
- The non-populated areas of the Box (OU2); and
- Mining-related contamination in the broader Coeur d'Alene Basin (the "Basin" or OU3).

# Brief Site History

The Bunker Hill Superfund Site is within one of the largest historical mining districts in the world. Commercial mining for lead, zinc, silver, and other metals began in the Silver Valley in 1883. Heavy metals contamination in soil, sediment, surface water, and groundwater from over 100 years of commercial mining, milling, smelting, and associated modes of transportation has impacted both human health and environmental resources in many areas throughout the Site.

The principal sources of metals contamination were tailings generated from the milling of ore discharged to the South Fork Coeur d'Alene River (SFCDR) and its tributaries or confined in large waste piles onsite; waste rock; and air emissions from smelter operations. Tailings were frequently used as fill for residential and commercial construction projects. Spillage from railroad operations also contributed to contamination across the Site.

Tailings were also transported downstream, particularly during high flow events, and deposited as lenses of tailings or as tailings/sediment mixtures in the bed, banks, floodplains, and lateral lakes of the Coeur d'Alene River Basin and in Coeur d'Alene Lake. Some fine-grained material washed through the lake and was deposited as sediment within the Spokane River flood channel. The estimated total mass and extent of impacted materials (primarily sediments) exceeds 100 million tons dispersed over thousands of acres (USEPA, 2001c). Over time, groundwater also became contaminated with metals.

Air emissions occurred from ore-processing facilities in Kellogg and Smelterville. Although both the lead smelter and zinc plant had recycling processes designed to minimize air-borne particulates, significant metals deposition still occurred together with deposition of sulfur dioxide emissions. These emissions affected areas near the smelter and zinc plant, and greatly contributed to the denuding of surrounding hillsides.

Smelter operations ceased in 1981, but limited mining and milling operations continued onsite from 1988 to 1991, and small-scale mining operations continue today.

After listing on the NPL in 1983, remedial investigations (RIs) and feasibility studies (FSs) initially focused on the 21-square-mile Bunker Hill Box (MFG, 1992a and 1992b). The USEPA published the first Site Record of Decision (ROD) in August 1991 providing the Selected Remedy for OU1 residential soils (USEPA, 1991). The second ROD for the Site was published by the USEPA in September 1992 addressing contamination in the non-populated OU2, as well those aspects of OU1 that were not addressed in the 1991 OU1 ROD (USEPA, 1992). These two OUs then proceeded into remedial design (RD) and remedial action (RA) phases of work. Since publication of the 1992 OU2 ROD, a number of remedy changes and clarifications have been documented in two OU2 ROD amendments (September 1996 and December 2001) and two Explanations of Significant Differences or "ESDs" (January 1996 and April 1998).

The USEPA began the Remedial Investigation and Feasibility Study (RI/FS) for OU3 in 1998 (USEPA, 2001b and 2001c) and issued its interim thirty (30) year ROD to clean up mining contamination in 2002 (USEPA, 2002). A number of removal actions to address immediate threats and/or obvious sources of contamination in or along streams were initiated prior to the OU3 ROD. Remedial design, remedial action, and studies to support future OU3 remedial actions were initiated in 2003.

The first five-year review of the Bunker Hill Superfund Site remedies resulted in two separate five-year review reports: one for OU1 (USEPA, 2000b) and the other for OU2 (USEPA, 2000a). The USEPA published these reports in September 2000, approximately 5 years after initiation of the first remedial action at the Site. This five-year review is the second evaluation of remedy performance of OUs 1 and 2. It also focuses for the first time on the remedies for OU3; however, the large majority of the OU3 remedies have yet to be implemented.

## Review of Selected Remedies

As stated above, the purpose of this review was to evaluate the remedies that have been or will be implemented at the Site. This second, site-wide five-year review report documents the results of the review, and identifies issues found during the review and the recommendations to address them. The USEPA will track the identified issues and recommendations to ensure that follow-up actions are completed.

The following section provides a summary of:

- The site activities and remedial actions completed in the last five years by operable unit; and
- The issues and recommendations identified during this review.

### Operable Unit 1

#### Introduction

Operable Unit 1 is located within the 21-square-mile area surrounding the former smelter complex commonly referred to as the Bunker Hill "Box." The Box is located in a steep mountain valley in Shoshone County, Idaho, east of the city of Coeur d'Alene. Interstate 90 (I-90) bisects the Box and parallels the SFCDR.

OU1 is often referred to as the populated areas of the Bunker Hill Box and is home to more than 7,000 people in the cities of Kellogg, Wardner, Smelterville, and Pinehurst, as well as the unincorporated communities of Page, Ross Ranch, Elizabeth Park, and Montgomery Gulch. The populated areas include residential and commercial properties, street rights-of-way (ROWs), and public use areas. Most of the residential neighborhoods and the former smelter complex are located on the valley floor, side gulches, or adjacent hillside areas. Cleanup activities first began in OU1 because this was the area of greatest concern for human health exposure from mine waste.

### ROD Issuance

The OU1 Selected Remedy and remedial action objectives (RAOs) are described in the 1991 ROD (USEPA, 1991) and the 1992 ROD (USEPA, 1992). The primary goal of the OU1 Selected Remedy is to reduce children's intake of lead from soil and dust sources to meet the following RAOs:

- Less than 5 percent of children with blood lead levels of 10 micrograms per deciliter (μg/dL) or greater; and
- Less than 1 percent of children with blood lead levels of 15 μg/dL or greater.

### Major Components of the Selected Remedy

To achieve these objectives, the cleanup strategy includes:

- Implementation of a lead health intervention program for local families;
- Remediation of all residential yards, commercial properties, and right-of-ways (ROWs) that have soil lead concentrations greater than 1,000 milligrams per kilogram (mg/kg);
- Achieving a geometric mean yard soil lead concentration of less than 350 mg/kg for each residential community in OU1;
- Controlling fugitive dust and stabilizing and capping contaminated soils throughout the Bunker Hill Box (OU1/OU2);
- Achieving a geometric mean of interior house dust lead levels of 500 mg/kg or less for each community, with no individual house dust level exceeding 1,000 mg/kg; and
- Establishing an Institutional Controls Program (ICP) to maintain protective barriers over time, and to ensure that future land use and development is compatible with the OU1 Selected Remedy.

### Remedial Actions

Table ES-1 at the end of this summary provides a brief description of the activities and remedial actions conducted since the last five-year review for OU1 (USEPA, 2000b). More detailed descriptions of the various remedial actions and the specific ROD requirements that apply to each action are presented in Section 3 of this report.

### Issues, Recommendations, and Follow-up Actions

As part of this five-year review, issues, recommendations, and follow-up actions have been identified to improve remedy performance or protectiveness to meet the RAOs and performance standards. Tables ES-2 and ES-3 summarize these issues, recommendations, and follow-up actions for OU1. Also identified in these tables are parties responsible for implementation and oversight of these actions, proposed completion milestone dates, and the potential to affect protectiveness of the remedy. This information is also summarized in Section 6.1

## Operable Unit 2

### Introduction

Operable Unit 2 includes the non-populated, non-residential areas of the Bunker Hill Box. These non-populated areas include the former industrial complex and Mine Operations Area (MOA) in Kellogg, the Smelterville Flats (the floodplain of the SFCDR in the western half of OU2), hillsides, various creeks and gulches, the Central Impoundment Area (CIA), and the Bunker Hill Mine and associated Acid Mine Drainage (AMD). The SFCDR within OU2 and the non-populated areas of the Pine Creek drainage are both addressed as part of OU3.

### OU2 ROD Issuance

A ROD for OU2 was published by the USEPA in 1992 (USEPA, 1992). Since then, two OU2 ROD amendments (USEPA 1996a and 2001a) and two ESDs (USEPA 1996b and 1998) have been published.

The 1996 OU2 ROD Amendment changed the remedy for principal threat materials (PTMs) from chemical stabilization to containment. The 2001 OU2 ROD Amendment addressed AMD issues within the OU2 boundaries. To date, the USEPA and the State of Idaho have not concluded negotiations on a State Superfund Contract (SSC) amendment that allows for full implementation of the 2001 OU2 ROD Amendment. Time-critical components of this ROD amendment were implemented, however, to avoid potential catastrophic failure of the aging Central Treatment Plant (CTP) and to provide for emergency mine water storage (USEPA and IDEQ, 2003). These time-critical activities focused on preventing discharges of AMD to Bunker Creek and the SFCDR. Until a SSC amendment is signed allowing for full implementation of the 2001 OU2 ROD Amendment, control and treatment of AMD and its impact on water quality will continue to be an issue. The USEPA and the State of Idaho continue to discuss the SSC amendment, and the long-term obligations associated with the full mine water remedy.

The two ESDs did not change the OU2 Selected Remedy; rather they clarified portions of the remedy. The 1996 OU2 ESD addressed differences associated with placement of waste and demolition materials in the Smelter Closure Area (SCA). The 1998 OU2 ESD addressed differences associated with the stabilization and removal of contaminated materials located in the tributary gulches within OU2, the USEPA financial contribution to the lower Milo Creek/Wardner/Kellogg pipeline system, placement of mine wastes from outside of OU2 into the CIA, and other clarifications on the OU2 selected remedy (see Section 4.1).

### Major Components of the Selected Remedy

The 1992 OU2 ROD set forth priority cleanup actions to protect human health and the environment. Cleanup actions included a series of source removals, surface capping, reconstruction of surface water creeks, demolition of abandoned milling and processing facilities, engineered closures for waste consolidated onsite, revegetation efforts, and treatment of contaminated water collected from various site sources.

In 1995, with the bankruptcy of the Site's major Potentially Responsible Party (PRP), the USEPA and the State of Idaho defined a path forward for phased remedy implementation in OU2. Phase I of remedy implementation includes extensive source removal and stabilization efforts, all demolition activities, all community development initiatives, development and initiation of an ICP, future land use development support, and public health response actions. Also included in Phase I are additional investigations to provide the necessary information to resolve long-term water quality issues, including technology assessments and pilot studies, evaluation of the success of source control efforts, development of site-specific water quality and effluent-limiting performance standards, and development of a defined operation and maintenance (O&M) plan and implementation schedule. Interim control and treatment of contaminated water and AMD is also included in Phase I of remedy implementation. Phase I remediation began in 1995, and source control and removal activities are near completion.

Phase II of the OU2 remedy will be implemented following completion of source control and removal activities and evaluation of the impacts of these activities on meeting water quality improvement objectives. Phase II will consider any shortcomings encountered in implementing Phase I and will specifically address long-term water quality and environmental management issues. In addition, the ICP and future development programs will be reevaluated as part of Phase II.

The effectiveness evaluation of the Phase I source control and removal activities to meet the water quality improvement objectives of the 1992 OU2 ROD will be used to determine appropriate Phase II implementation strategies and actions. In addition, although the 1992 OU2 ROD goals did not include protection of ecological receptors, additional actions may be considered within the context of site-wide ecological cleanup goals. Both ROD and SSC amendments are required prior to implementation of Phase II remedial actions.

### Remedial Actions

Table ES-4 provides a brief description of each activity or remedial action that is part of the OU2 remedy. More detailed descriptions of the various remedial actions and the specific ROD requirements that apply to each action are presented in Section 4 of this report.

### Issues, Recommendations, and Follow-up Actions

As part of this five-year review, issues, recommendations, and follow-up actions have been identified to improve remedy performance or protectiveness to meet the RAOs and performance standards. Tables ES-5 and ES-6 summarize these for OU2. Also identified in these tables are parties responsible for implementation and oversight of these actions, proposed completion milestone dates, and the potential to affect protectiveness of the remedy. This information is also summarized in Section 6.2 of this report.

## Operable Unit 3

### Introduction

Operable Unit 3 consists of the mining-contaminated areas in the Coeur d'Alene Basin outside of OU1 and OU2, primarily the floodplain and river corridor of the Coeur d'Alene River (including Coeur d'Alene Lake) and the Spokane River, as well as those areas where mine wastes have come to be located as a result of their use for road building or for fill and construction of residential or commercial properties. Spillage from railroad operations also contributed to contamination across the Basin. OU3 contaminants are primarily metals, and the metals of principal concern include lead and arsenic for protection of human health, and lead, cadmium, and zinc for protection of ecological receptors.

### Removal Actions

Prior to issuance of the 2002 OU3 interim ROD (USEPA, 2002), some of the most highly impacted source materials were contained via removal actions to reduce human health and environmental risks. These removal actions were implemented under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) authority primarily from 1997 to 2002, with a few occurring prior to that time and some continuing to the present. The OU3 removal actions are briefly summarized in Table ES-7 and again in Table 5-16 in Section 5 of this report. Tables ES-8 and ES-9 provide a summary of the issues and recommendations related to the OU3 removal actions.

### RI/FS Process

From 1998 through 2001, the USEPA collected data and conducted an RI/FS for the Basin (USEPA, 2001b and 2001c). The area of study in the OU3 remedial investigation included four geographic areas:

- Upper Basin outside of the Box, which includes the communities of Mullan, Wallace, Burke, Osburn, Silverton, and the South Fork Coeur d'Alene River, Canyon Creek, Ninemile Creek, Big Creek, Moon Creek, and Pine Creek;
- Lower Basin, which includes the communities of Kingston, Cataldo, and Harrison, and the Coeur d'Alene River, adjacent lateral lakes, floodplains, and associated wetlands;
- Coeur d'Alene Lake; and
- Depositional areas of the Spokane River.

### OU3 ROD Issuance

On September 12, 2002, the USEPA issued an interim ROD to address mining contamination in the broader Coeur d'Alene Basin (OU3) (USEPA, 2002). The cleanup plan resulted from several years of intensive studies to determine the extent of contamination and the associated risks to people and the environment. The 2002 OU3 interim ROD (hereafter "2002 OU3 ROD") describes the specific cleanup work, called the interim Selected Remedy (hereafter "the remedy") that will occur in the Basin at a cost of about $360 million over approximately the next thirty (30) years. The following governments and agencies in the areas targeted for cleanup gave their support for conducting the cleanup selected in the 2002 OU3 ROD: the State of Idaho, the Coeur d'Alene Tribe, the Spokane Tribe, the State of Washington, the U.S. Bureau of Land Management (BLM), the U.S. Fish and Wildlife Service (USFWS), and the U.S. Forest Service (USFS).

The 2002 OU3 ROD represents a significant step toward meeting the goal of full protection of human health and the environment in the Basin. The cleanup plan includes:

- The full remedy needed to protect human health in the community and residential areas, including identified recreational areas of the Upper Basin and Lower Basin, as well as Washington recreational areas along the Spokane River upstream of Upriver Dam; and

- An interim remedy of prioritized actions for protection of the environment that focus on improving water quality, minimizing downstream migration of metal contaminants, and improving conditions for fish and wildlife populations.

Certain potential exposures to human health outside of the communities and residential areas of the Upper Basin and Lower Basin were not addressed by the 2002 OU3 ROD. These potential exposures impacting human health include:

- Recreational use at areas in the Upper Basin and Lower Basin where cleanup actions are not implemented pursuant to the 2002 OU3 ROD;
- Subsistence lifestyles, such as those traditional to the Coeur d'Alene and Spokane tribes; and
- Potential future use of groundwater that is currently contaminated with metals.

In addition, a remedy for Coeur d'Alene Lake is not included in the 2002 OU3 ROD. State, tribal, federal, and local governments are in the process of developing a revised lake management plan outside of the Superfund process using separate regulatory authorities.

### Major Components of the Interim Selected Remedy

The 2002 OU3 ROD lays out approximately 30 years of priority cleanup actions that will maximize environmental protection and cost-effectiveness. For protection of human health in the community and residential areas of the Upper Basin and Lower Basin, the major components of the interim Selected Remedy include:

- Lead health information and intervention programs for residential and recreational users;
- Partial excavation and replacement of residential soils with lead concentrations above 1,000 mg/kg and/or arsenic concentrations above 100 mg/kg, a barrier such as a vegetative barrier to control or limit migration of soils with lead concentrations between 700 and 1,000 mg/kg, and a combination of removals, barriers, and access restrictions for street ROWs, commercial properties, and recreational areas;
- Alternate drinking water sources for residences using contaminated private drinking water sources;
- Evaluation of lead in house dust, after residential soil remediation is completed, to determine if interior cleaning is needed; and,
- Establishment of an ICP to maintain protective barriers over time, and guide land use and future development.

For environmental protection in the Upper and Lower Basin, three environmental priorities were identified in the 2002 OU3 ROD:

- Dissolved metals in surface water (particularly zinc and cadmium) have harmful effects on fish and other aquatic life;
- Lead in soil and sediment is present in the beds, banks, and floodplains of the river system and has harmful effects on waterfowl and other wildlife; and

- Particulate lead in surface water is transported downstream and is a continuing source of contamination for the Coeur d'Alene River, Coeur d'Alene Lake, and the Spokane River. Lead transported in particulate form in the river has impacted recreational areas in the Lower Basin and the Spokane River, resulting in posted health advisory signs at beaches and swimming areas. During flood events, lead transported by the river also impacts the wetlands and floodplains.

The Selected Remedy for the Washington Recreational Areas along the Spokane River identified in the 2002 OU3 ROD is a combination of access controls, capping, and removals of metals-contaminated soil and sediment. The remedy includes water quality monitoring, aquatic life monitoring, remedial performance monitoring of sediments, and contingencies for additional or follow-up cleanups for the recreational areas. Ten shoreline recreation areas and one subaqueous area along the Spokane River in Washington State have been identified for further investigation and remedial action.

As stated above, a remedy for Coeur d'Alene Lake is not included in the 2002 OU3 ROD. State, tribal, federal, and local governments are in the process of developing a revised lake management plan outside of the Superfund process using separate regulatory authorities. The OU3 ROD does state, however, that the USEPA will evaluate lake conditions in future five-year reviews.

### Implementing the Selected Remedy

The USEPA's first priority for implementation of the 2002 OU3 ROD is to remediate residential and recreational areas that pose direct human health risks. Subsequent actions will include cleanup of areas that pose ecological risks. EPA Region 10 has received funding for implementation of the OU3 human health remedy. The Region will continue to work with EPA Headquarters and other parties to secure funding for full implementation of the 2002 OU3 ROD.

Idaho state legislation under the Basin Environmental Improvement Act (Title 39, Chapter 810) established the Coeur d'Alene Basin Environmental Improvement Project Commission (Basin Commission). This commission includes federal, state, tribal, and local governmental involvement. The USEPA serves as the federal government representative to the Basin Commission and will continue to work closely with the governments and communities as they implement the cleanup plan. The USEPA will continue to be responsible for ensuring that the cleanup work meets the requirements of the 2002 OU3 ROD as well as CERCLA laws and regulations.

The National Academies' National Research Council (NRC) is conducting an independent evaluation of the Coeur d'Alene Basin to examine the USEPA's scientific and technical practices in Superfund site characterization, human and ecological risk assessment, remedial planning, and decision-making. The NRC is an independent, nongovernmental institution that advises the nation on scientific, technical, and medical issues. The Idaho Congressional delegation requested that the study be performed and Congress mandated that the USEPA fund the study at a cost of $850,000. The NRC convened the Committee on Superfund Site Assessment and Remediation in the Coeur d'Alene Basin, composed of members with a wide range of expertise and backgrounds.

The NRC study began in June 2003. During the study, the NRC held public sessions in Washington, D.C.; Wallace, Idaho; and Spokane, Washington. On July 14, 2005, the NRC released a pre-publication version of its report (see www.nas.edu, search on "coeur") (NRC, 2005). The pre-publication report reflects unanimous consensus of the Committee and has undergone a rigorous peer review process. On July 15, 2005, the NRC hosted a public meeting at the North Idaho College in Coeur d'Alene to share the report findings and answer questions from the public. The final NRC report will be published in book form in December 2005.

The USEPA is conducting a careful review of the NRC pre-publication report recommendations and findings. The USEPA, along with others invested in the issues, are considering the NRC report's recommendations and, where appropriate, will translate those findings into action. Region 10 remains committed to work closely with the Coeur d'Alene Basin Commission, as well as the Commission's Technical Leadership Group (TLG) and Citizens' Coordinating Council (CCC).

### Remedial Actions

Table ES-10 provides a brief description of each activity or remedial action that has been implemented to date as part of the OU3 remedy. More detailed descriptions of the various remedial actions and the specific ROD requirements that apply to each action are presented in Section 5 of this report.

### Issues, Recommendations, and Follow-up Actions

As part of this five-year review, issues, recommendations, and follow-up actions have been identified to improve remedy performance or protectiveness to meet the RAOs and performance standards. As stated above, Tables ES-8 and ES-9 summarize these for OU3 removal actions. Tables ES-11 and ES-12 summarize these for the 2002 OU3 ROD remedial actions. Also identified in these tables are parties responsible for implementation and oversight of these actions, proposed completion milestone dates, and the potential to affect protectiveness of the remedy. This information is also summarized in Section 6.3.

# Protectiveness of the Remedy

## Operable Unit 1

The remedy being implemented in OU1 is expected to be protective of human health and the environment upon completion, provided that follow-up actions identified in Table ES-3 are implemented.

Although the remedy has not been fully implemented, environmental data (except ROW data) indicate that the remedy is functioning as intended by the ROD. As remediation nears completion, soil and house dust lead concentrations are declining, lead intake rates have been substantially reduced, and blood lead levels have achieved their RAOs. House dust lead levels are declining but some individual homes continue to exceed lead concentrations of 1,000 milligrams per kilogram (mg/kg). For ROWs, data indicate that lead levels are stabilizing but are continuing to slowly increase over time.

There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy; however, due to the history of flooding in the area, it is possible that future flood events may affect remedy protectiveness. In addition, the ability of the local communities to improve and maintain infrastructure to protect the remedy is a concern. Infrastructure improvements and ROW recontamination will be evaluated in the next five-year review, as well as determining whether all the RAOs have been met once the remedy is completed.

## Operable Unit 2

The remedy being implemented in OU2 is expected to be protective of human health and the environment upon completion, and in the interim, human health exposure pathways that could result in unacceptable risks are being controlled.

In 1995, with the bankruptcy of the Site's major PRP, the USEPA and the State of Idaho defined a path forward for phased remedy implementation in OU2. Phase I of remedy implementation includes extensive source removal and stabilization efforts, all demolition activities, all community development initiatives, development and initiation of an ICP, future land use development support, and public health response actions. Also included in Phase I are additional investigations to provide the necessary information to resolve long-term water quality issues, including technology assessments and pilot studies, evaluation of the success of source control efforts, development of site-specific water quality and effluent-limiting performance standards, and development of a defined O&M plan and implementation schedule. Interim control and treatment of contaminated water and AMD is also included in Phase I of remedy implementation. Phase I remediation began in 1995, and source control and removal activities are near completion.

Since beginning the implementation of Phase I in 1995, a significant amount of remediation work has been conducted. As summarized in Table 4-1 of this report, over 3.3 million cubic yards of contaminated waste have been removed and consolidated onsite in engineered closure areas (the Smelter and CIA Closures). The use of geomembrane cover systems on these closure areas effectively removes these contaminated wastes from direct contact by humans and biological receptors. Consolidating these wastes in engineered closures also substantially reduces the exposure pathway to the surface water and groundwater environment in comparison to pre-remediation site conditions.

Also, as summarized in Table 4-1, over 800 acres of property within OU2 have been capped to eliminate direct contact with residual contamination that remains in place within some areas of OU2. In addition, the revegetation work conducted as part of the Phase I remedial actions has substantially controlled erosion and has significantly improved the visual aesthetics of OU2. The success of the Phase I revegetation efforts is providing improved habitat for wildlife that was largely absent for decades in many areas of the hillsides and Smelterville Flats.

All of these efforts have reduced or eliminated the potential for humans to have direct contact with soil/source contaminants, have reduced opportunities for transport of contaminants by surface water and air, and are expected to provide surface and groundwater quality improvements over time throughout the Site.

Phase II of the OU2 remedy will be implemented following completion of source control and removal activities and evaluation of the impacts of these activities on meeting water quality improvement objectives. Phase II will consider any shortcomings encountered in implementing Phase I and will specifically address long-term water quality and environmental management issues. In addition, the ICP and future development programs will be reevaluated as part of Phase II.

The effectiveness evaluation of the Phase I source control and removal activities to meet the water quality improvement objectives of the 1992 OU2 ROD will be used to determine appropriate Phase II implementation strategies and actions. In addition, although the 1992 OU2 ROD goals did not include protection of ecological receptors, additional actions may be considered within the context of site-wide ecological cleanup goals. Both ROD and SSC amendments are required prior to implementation of Phase II remedial actions.

In addition to evaluating Phase I actions and identifying possible Phase II actions, an SSC amendment that allows for the full implementation of the 2001 OU2 ROD Amendment needs to be negotiated and signed. Time-critical components of this ROD amendment were implemented to prevent catastrophic failure of the Central Treatment Plant (CTP) and discharges of AMD to Bunker Creek and the SFCDR. Until an SSC is signed, however, control and treatment of AMD and its impact on water quality will continue to be an issue. The USEPA and the State of Idaho continue to discuss the SSC amendment and the long-term obligations associated with the mine water remedy.

### Operable Unit 3

The OU3 ROD is a 30-year cleanup plan that was published by the USEPA in September 2002. Therefore, remedy implementation has been ongoing for approximately 3 years and a protectiveness determination of the OU3 remedy cannot be made until further information is obtained. This additional information will be collected during the implementation of the remedy and through the completion of studies that support the remedy. For the human health remedy being implemented in the OU3 residential and community areas, including identified recreational areas, the remedy is expected to be protective of human health and the environment upon completion. In the interim, exposure pathways that could result in unacceptable risks are being controlled. OU3 ecological remedial actions have not yet been implemented. Protectiveness of the OU3 remedy will be evaluated in the next five-year review.

## Next Five-Year Review

The USEPA is required by statute (CERCLA) to conduct remedy reviews every 5 years at Superfund sites where hazardous substances remain onsite above levels that allow for unlimited use and unrestricted exposure. The trigger date for completion of these reviews is 5 years after initiation of the first remedial action at the Site. The first remedial action at the Bunker Hill Superfund Site started in 1995. Since onsite containment of hazardous substances is part of the Site's Selected Remedy, the first five-year review was completed on September 27, 2000. This second five-year review and report was required to be completed by September 27, 2005; however, due to the 30-day extension of the public comment period, the final report was delayed by approximately one month.

The next review (the third five-year review) of the Bunker Hill Superfund Site will be conducted within 5 years of the completion date of this second five-year review report. The third five-year review report will cover all remedial work, monitoring, and O&M activities conducted at the Site. In addition, as stated in the 2002 OU3 ROD, the USEPA will continue to evaluate Coeur d'Alene Lake conditions in the next and future five-year reviews.

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**Table ES-1. Summary of ROD Activities and Remedial Actions – Operable Unit 1**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Soil Remediation | Upstream Mining Group (UMG) | 1994-Present | Partially excavate contaminated soils and install clean soil barriers or other protective barriers (e.g., gravel and asphalt) on residential yards, commercial properties, and rights-of-way in OU1. Ensure proper disposal of contaminated soils in the Page Repository. From 2002-2004, the USEPA and the IDEQ took over a portion of the UMG's Consent Decree work obligations. The USEPA and the IDEQ expect UMG to fully comply with the Consent Decree (CD) requirements from 2005 forward. |
| Hillside Sloughing and Stabilization | IDEQ, USEPA | 1995-2004 | Stabilize hillside areas adjacent to residential yards that are sloughing contaminated soils into residential yards. |
| Air Monitoring | UMG, USEPA, | 1995-Present | Monitor air quality through personal monitors used by workers at yard remediations and other monitoring stations in the Box. OU1 monitoring stations were discontinued in 2003 but personal monitors are continuing to be used by workers at yard remediations. |
| House Dust Monitoring | IDEQ, USEPA | 1988-Present | Monitor house dust lead concentrations, lead loading rates, and dust loading rates through vacuum bags and dust mats as residential soil remediation is completed. |
| Interior Cleaning Pilot Project | IDEQ, USEPA | 2000 | As follow-up to the 1990 interior cleaning pilot project, completed a second pilot project to assess the long-term effectiveness and costs for a one-time interior cleaning program in a community where soil remediation has been completed (i.e., Smelterville). |
| Lead Health Intervention Program (LHIP) | PHD | 1985-present | Provide health education services to local residents, including annual blood lead screening and nurse follow-up visits for children with elevated blood lead levels to help identify and reduce exposures. |
| Institutional Controls Program (ICP) | PHD | 1995-Present | Ensure that protective barriers are maintained over time and provide services to local residents, including vacuum loan program and free disposal locations for contaminated residential soils. |

**Table ES-2. Summary of Issues - Operable Unit 1**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **Right-of-Way (ROW) Recontamination:** ROW recontamination appears to be increasing at a slow rate. | N | Y |
| **Hillside Sloughing:** Contamination from eroding hillsides adjacent to residential areas was identified as a potential source of recontamination. Most of these hillsides have been addressed, but there could still be some that need to have appropriate controls installed. | N | Y |
| **One-time Interior Cleaning:** Results of two pilot studies indicate that house dust lead concentrations return to pre-remediation levels within one year of cleaning, regardless of the cleaning method. Recent data confirm that house dust lead concentrations have achieved the community mean of 500 mg/kg and the number of homes exceeding 1,000 mg/kg lead in house dust is declining. | N | Y |
| **Institutional Controls Program (ICP):** Permanent funding of the ICP is needed to ensure success of the remedy. | N | Y |
| **Disposal/ICP Repository:** Long-term repository needs will require additional disposal capacity. | N | Y |
| **Infrastructure:** Infrastructure maintenance and improvements remain an issue. The remedy relies on functioning infrastructure to be sustainable. Resources to repair and install infrastructure have been difficult to secure by local governments. | Y | Y |

| Table ES-3. Summary of Recommendations and Follow-Up Actions – Operable Unit 1 | | | | | |
|---|---|---|---|---|---|
| | | | | Follow-up Actions: Affects Protectiveness (Y/N) | |
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Current (now to 1 year) | Future (>1 year) |
| **Right-of-Way (ROW) Recontamination:** Conduct ROW sampling and analysis to determine if lead concentrations have remained stable. | IDEQ | USEPA | 12/2009 | N | Y |
| **Hillside Sloughing:** Evaluate unaddressed hillside sloughing areas adjacent to residential yards and determine if control measures are needed. | IDEQ, USEPA | IDEQ, USEPA | 12/2006 | N | Y |
| **Mine Dumps:** Assess new information regarding erosion or access concerns for mine dumps on hillsides adjacent to residential yards. | IDEQ, USEPA | IDEQ, USEPA | 12/2006 | N | Y |
| **One-time Interior Cleaning:** Evaluate need for implementation of the interior cleaning component of the remedy. Continue monitoring house dust concentrations annually as soil remediation is completed. | IDEQ, USEPA | USEPA | 12/2006 | N | Y |
| **Lead Health Intervention Program (LHIP):** Continue offering services, including blood lead screening services and follow-up nurse visits to help identify and mitigate potential exposure pathways. | PHD | IDEQ, USEPA | 12/2009 | N | Y |
| **Institutional Controls Program (ICP):** Continue offering ICP programs, including the vacuum loan program. Secure permanent funding for the ICP as required by the 1994 Consent Decree. | PHD, Upstream Mining Group (UMG) | IDEQ, USEPA | 12/2007 | N | Y |
| **Disposal/ICP Repository:** Address long-term disposal needs as part of permanent funding for ICP, as required by the 1994 Consent Decree. Evaluate need for snow disposal area. | PHD,UMG | IDEQ, USEPA | 12/2007 | N | Y |

**Table ES-3. Summary of Recommendations and Follow-Up Actions – Operable Unit 1**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Infrastructure:** Repair and regularly maintain existing infrastructure (e.g., failing roads). | Local Governments | IDEQ, PHD, USEPA | 12/2009 | Y | Y |
| Identify funding and other resources for infrastructure maintenance and improvements to protect the remedy, such as storm water controls. | Local Governments, IDEQ, USEPA | IDEQ, PHD, USEPA | 12/2009 | Y | Y |

**Table ES-4. Summary of ROD Activities and Remedial Actions – Operable Unit 2**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Institutional Controls Program (ICP) | IDEQ | Ongoing | Same as the ICP program implemented in Operable Unit 1. |
| Health and Safety during Remediations | IDEQ , PRPs, USEPA | Ongoing | Ensure that remedial actions are implemented safely and in accordance with applicable regulations and guidance. |
| Operation and Maintenance (O&M) Plan, Operation and Maintenance | IDEQ , PRPs, USEPA | Ongoing | Ongoing monitoring, routine site inspections, and any necessary repair of completed remedial actions. Preparation of O&M Plans. |
| Hillsides | USEPA | 1990-1994 | Hillside terracing and vegetation programs by the Potentially Responsible Parties (PRPs). |
| | | 1996 | Initiation of government-led efforts for hillsides revegetation. |
| | | 2000-2005 | Revegetation of hillsides included hydroseeding, application of soil amendments, and planting of hardwood trees and shrubs. Annual evaluation and performance monitoring, maintenance as needed. Development of long-term O&M Plan and performance standards. Access controls maintained in some areas, but an issue in many areas. |
| Grouse Gulch | PRP | 1995-1997 | The Bunker Limited Partnership (BLP) removed approximately 1,200 cubic yards of tailings above the uppermost gabion structure from locations closest to the creek and disposed in the Central Impoundment Area (CIA). A new gabion dam was constructed in the lower reaches. Access roads were improved to enable access to gabion structures. The Wyoming mine dump located near the creek was buttressed at its base to minimize potential for erosion. Approximately 2,000 cubic yards of material were removed and disposed of at the CIA. |
| | | 1997-2005 | Remedial action has not required maintenance since its completion in 1997. Shoshone County is responsible for cleaning out Grouse Gulch sediment basins to help control flooding associated with Grouse Creek in Smelterville. |
| Government Gulch | USEPA | 1996-1998 | Demolition of industrial complex structures and stacks (e.g., Lead Smelter, Zinc Plant, and Phosphoric Acid Plant). Consolidation of debris in Smelter Closure. |
| | | 2000-2005 | Reconstruction of lower portion of Government Creek. Enyeart Lumber Yard capped, as well as other discrete areas in lower Government Gulch. Maintenance and rebuilding of 800 lf of upper creek channel. Recapping of disturbed areas planned for 2006. Riparian corridor planting. No further maintenance has been required. |

**Table ES-4. Summary of ROD Activities and Remedial Actions – Operable Unit 2**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Upper Magnet Gulch | USEPA | 1995-1999 | Source removal action, reconstruction of creek channel, revegetation. |
| | | 2000-2005 | No maintenance has been required since completion of remedial action in 1999. |
| Deadwood Gulch | USEPA | 1995-1998 | Source removal action, stabilize and reconstruct creek channel, revegetation. |
| | | 2001 | Riparian corridor planting of the Deadwood Creek conducted in 2001. |
| | | 2000-2005 | No maintenance has been required since completion of majority of remedial action in 1998. |
| Railroad Gulch | USEPA | 1997 | Reconstruction of creek channel and capping. |
| | | 2000-2005 | No maintenance has been required since completion of the remedial action in 1997. |
| Smelterville Flats – North of I-90 | USEPA | 1996-1998 | Source removal action, capping, revegetation, and stream bank stabilization. |
| | | 2000-2004 | Riparian plantings of trees and shrubs. Noxious weed control programs conducted periodically from 2001 through 2005 by the USACE. S&P Truck Stop area capped by the PRPs in 2001; was re-remediated by the USACE later in 2001. City/Gun range road east of the S&P Truck Stop capped in 2004. |
| Smelterville Flats – South of I-90 | USEPA | 1997-1998 | Source removal action, re-grading, capping, and surface water management. |
| | | 2001 | Improvements to surface water runoff control implemented in 2001, consisting of a vegetated swale and storm drain pipe. Recapped North Idaho Recycle Yard. |
| | | 2000-2005 | No maintenance has been required since completion of the remedial action. |
| Central Impoundment Area (CIA) | USEPA | 1995-2000 | Consolidation of Mine Operations Area (MOA) demolition debris and contaminated material from various source removal actions, geomembrane cover system, surface water drainage systems, capping CIA side slopes, revegetation. |
| | | 2000-2005 | Installed perimeter fencing to limit access to the CIA, final-graded access roads, and de-mobilized construction contractor in November 2000. Annual inspections and O&M ongoing. |

**Table ES-4. Summary of ROD Activities and Remedial Actions – Operable Unit 2**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Page Pond | PRP (UMG) | 1997-2000 | Removal of West Beach tailings. |
| | | 2000 | Tailings removal, capping, revegetation, surface water controls. Limited monitoring and O&M activities ongoing, but no additional remedial actions in Page Pond since 2000. |
| Industrial Complex: Smelter Closure Area and Principal Threat Materials (PTM) Cell | USEPA | 1995-1998 | Demolition of smelter structures, demolition and haul off Zinc Plant debris to smelter closure area, infilling demolition debris with slag, consolidation of source removal material at closure area, construction of PTM cell, placement of PTMs and closure of cell, geomembrane cover system, surface water management, revegetation, perimeter fencing. |
| | | 2004-2005 | Remedial action was complete in 1998. In 2004, a gravity collection and conveyance system for drain water was designed to replace a pumped system. System was constructed in 2005. Ongoing monitoring of well system for smelter closure observational approach. Minor routine O&M. |
| Industrial Complex: Borrow Area Landfill | IDEQ, USEPA | 1997-1998 | Borrow Area constructed to provide clean fill for site remediations. |
| | | 2000-2001 | Received waste from lower industrial landfill and other miscellaneous site waste below PTM action level. |
| | | 2002-2005 | Landfill closed; grading, surface water management, soil cover, revegetation, and settlement monitoring points. |
| | | | No maintenance has been required since closure of Borrow Area. |
| Industrial Complex: Area 14 | USEPA | 1997-1999 | Two sedimentation ponds (Gilges Pond and Sweeney Pond) were excavated and backfilled. |
| | | 2005 | Phased remedial design and remedial action to be initiated in 2006. |
| Mine Operations and Boulevard Areas | USEPA | 1995 | MOA: Demolition of structures, source removal actions, site grading, capping, and revegetation. |
| | | 1997 | Boulevard: Source removal action, replacement with clean soil, re-grading, surface waste management, revegetation. |
| | | 2000-2005 | No further remedial work has been conducted. No maintenance has been required since completion of these remedial actions. |

**Table ES-4. Summary of ROD Activities and Remedial Actions – Operable Unit 2**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Central Treatment Plant (CTP) | USEPA | 1994-1995 | Construction of CTP pond adjacent to McKinley Avenue. |
| | | 1996-1997 | Studies to prioritize maintenance needs and to optimize operation of CTP. |
| | | 1997 | Miscellaneous O&M, construction of direct discharge line from mine to CTP, ICP capping on CTP property. |
| | | 2001-Present | In 2001-2002, new direct feed mine water pipeline constructed from the Kellogg Portal to the CTP aeration basin. Emergency repairs and upgrades to the CTP and lined pond completed. |
| Bunker Creek | USEPA | 1997 | Source removal, reconstruction of creek channel, revegetation, and culverts for road crossings. |
| | | 2001-2002 | Riparian plantings along the creek corridor, ICP capping in area west of CIA closure, and construction of emergency overflow. Fence was installed between the Creek and the Union Pacific Railroad (UPRR) ROW/Trail in 2002. |
| | | | No maintenance has been required since completion of remedial action. The USEPA and the Department Idaho Fish and Game (IDFG) to address beaver dam, and monitor impact on remedy. |
| Union Pacific Railroad Right-of-Way (UPRR ROW) | PRP (UPRR) | 1995-2000 | Source removals, re-use of decontaminated materials, capping with clean barriers in accordance with 1995 Consent Decree. |
| (excluding OU3 Trail of the Coeur d'Alenes) | | 2000-Present | Remediation of the portions of the UPRR ROW adjacent to the CIA haul road and verification sampling (2000). Certification of the UPRR remedial action and incorporation of the ROW into the ICP (2001). Remaining pieces of government response areas remediated and old fuel bulk plant on the UPRR ROW in Kellogg removed and remediated (2002-2004). Portions of the UPRR ROW paved with an asphalt path. In 2005, the USACE remediated several discrete areas: one area east of Ross Ranch, and one haul road shoulders south of TCI building. The USACE will also remediate several bare patches along trail and fence line in late 2005 or early spring 2006.Inspection/monitoring and O&M activities ongoing. |

**Table ES-4. Summary of ROD Activities and Remedial Actions – Operable Unit 2**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Milo Gulch and Reed Landing | IDEQ USEPA | 1995-2000 | Milo Creek: source removal, water diversion dam and pipeline on the main stem of Milo Creek. Remedial action of lower Milo Gulch essentially complete in 2000.<br>Reed Landing: Re-grading to stable slope, disposal at Guy Caves, construction of reinforced concrete emergency overflow channel. |
| | | 2005-Ongoing | Upper Milo basin requires additional remediation (pending) per the 2001 OU2 Record of Decision (ROD) Amendment. The USEPA currently conducting remedial design of West Fork Diversion. Routine maintenance ongoing. |
| A-4 Gypsum Pond | PRP (SMC) | 1996-2000 | Construction of run-on ditches along up-gradient perimeter, removal of upper portion of existing north perimeter embankment and re-graded the downstream face of the embankment, rerouted Magnet Creek over the A-4 Gypsum Pond and then excavated and lowered Magnet Gulch channel down to the native soils at the floor of the tailings pond, construction of lined drainage channel and outfall works around the pond near eastern perimeter to convey drainage from Deadwood Gulch to Bunker Creek, installed seepage barrier along north perimeter of McKinley Pond and a new sealed culvert under McKinley Avenue from McKinley Pond. |
| | | 2001-Present | Installation of a French drain along the toe of the north dike. Completed construction of a primary drainage channel and associated outfall works at the extreme west side of the A-4 closure area to convey perennial and seasonal flows that originate from the upper reaches of Magnet Gulch, infilled existing solution cavities, plugging and partial removal of the former decant piping and re-grading of the impounded gypsum, construction of runoff control ditches near the down-gradient perimeter of the closure area to intercept and divert localized drainage to either Magnet Gulch or Deadwood Gulch channels, cover soil was placed on the A-4 complex at numerous times following remediation work and in 2002 soil was applied to the west end of the A-4 in association with the completion of the Magnet Gulch channel, in 2003 SMC applied cover soil over 75 percent of the A-4 to replace re-contaminated cover-soil, and vegetation was established on site following soil placement in 1996. The goal at that time was to minimize water infiltration into the soil cap by increasing evapotranspiration. However, the vegetation in much of the area was eliminated when the cover soil was replaced again in 2003. Final seeding completed in 2005. Final vegetative performance will be a function of O&M and the responsibility of the Stauffer Management Company (SMC). |
| South Fork Coeur d'Alene River Removal and Stabilization Project | IDEQ , USEPA | 2000-2004 | Removal and stabilization project: contaminated floodplain sediments excavated and hauled for disposal, eastern and western halves of the river reach reconstructed and revegetated, and upland areas reseeded. |

**Table ES-4. Summary of ROD Activities and Remedial Actions – Operable Unit 2**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Miscellaneous Box Projects | IDEQ, USEPA | 1998-Present | Variety of miscellaneous projects in support of larger remedial actions in OU2 including City of Smelterville fencing and road and shoulder paving, remediation of Airport road shoulders and area residences, clean water supply to users of Hangaard Arena, McKinley Avenue capping, remediation of Pinehurst Golf Course parking lot, surrounding areas of Kellogg Project office, east Smelterville private properties, residential properties and ROWs adjacent to UMG-responsible properties, and a number of access controls in the Box. |
| OU2 Water Quality Monitoring | IDEQ, USEPA | 1996-Present | Groundwater and surface water monitoring at several locations throughout OU2 to provide water quality data during remedial action implementation and provide data for post-implementation Phase I remedial action effectiveness. |

**Table ES-5. Summary of Issues - Operable Unit 2**

| Issues | Affects Protectiveness (Y/N) Current (now to 1 year) | Affects Protectiveness (Y/N) Future (>1 year) |
|---|---|---|
| **OU2 Institutional Controls Program (ICP)** | | |
| **Funding:** Permanent funding of the ICP is needed to ensure success of the remedy. At this time, permanent funding for the OU2 ICP has not been secured. | N | Y |
| **Disposal/ICP Repository:** Long-term repository needs will require additional disposal capacity. | N | Y |
| **ICP Database:** Type and depth of barrier and contamination left behind for OU2 areas needs to be incorporated into ICP database to support long-term ICP management. | N | Y |
| **Hillsides** | | |
| **Hillsides Access Control:** Use of the hillsides by unsanctioned off-road vehicles may result in a potential human health risk from residual contamination and is producing wheel ruts that could lead to detrimental erosion. | N | Y |
| **Gulches** | | |
| **Biological Monitoring:** Elevated metals concentrations were observed in Deadwood, Government and Magnet Gulches during biomonitoring. | N | Y |
| **Smelterville Flats** | | |
| **Biological Monitoring:** Elevated metals concentrations were observed in North of I-90 areas during biomonitoring. | N | Y |
| **Central Impoundment Area (CIA)** | | |
| **State Superfund Contract (SSC) for 2001 OU2 ROD Amendment**: Lack of a SSC amendment prevents full implementation of the 2001 OU2 ROD Amendment, including installation of a new lined sludge pond on the CIA (if required). | Y | Y |
| **Page Pond** | | |
| **North Channel:** The North Channel revegetated area has not survived the initial hydroseeding and tailings are exposed. This channel is near the Trail of the Coeur d'Alenes and the South Fork Sewer District's lift station. | Y | Y |
| **Remedial Effectiveness Monitoring Program:** Possible issues in the existing Page Pond monitoring | N | Y |

| Table ES-5. Summary of Issues - Operable Unit 2 | | |
|---|---|---|
| Issues | Affects Protectiveness (Y/N) | |
| | Current (now to 1 year) | Future (>1 year) |
| program, which were noted in the first five-year review, have not been further analyzed. | | |
| **Repository Vehicle Decontamination:** Additional vehicle decontamination procedures have not been implemented at the repository. | Y | Y |
| **Biological Monitoring:** Mitigative measures should be considered for wetland loss at West Page Swamp due to expansion of Page Repository. | N | Y |
| **Remedy Implementation:** The remedy has not been fully implemented and no remedial actions have been conducted since 2000. | Y | Y |
| **Industrial Complex** | | |
| **State Superfund Contract (SSC) for 2001 OU2 ROD Amendment:** Lack of a SSC amendment between the USEPA and the State of Idaho prevents full implementation of the 2001 OU2 ROD Amendment that would upgrade the CTP where Smelter Closure flows are treated. | Y | Y |
| **Central Treatment Plant (CTP)** | | |
| **State Superfund Contract (SSC) for 2001 OU2 ROD Amendment:** Lack of a SSC amendment prevents full implementation of the 2001 OU2 ROD Amendment, including control of AMD into the CTP, additional CTP upgrades, and placing a new lined sludge pond on the CIA . | Y | Y |
| **AMD Discharge from Reed and Russel:** Control of AMD discharge at the Reed and Russel adits. | Y | Y |
| **Bunker Creek** | | |
| **State Superfund Contract (SSC) for 2001 OU2 ROD Amendment:** Lack of a SSC amendment between the USEPA and the State of Idaho prevents full implementation of the 2001 OU2 ROD Amendment. Until the full 2001 OU2 ROD Amendment is implemented, cleanup of contaminated sediments in the Bunker Creek channel caused from mine and tributary flows and minor CTP upsets is not feasible. | Y | Y |
| **Ambient Water Quality Standards (AWQC):** Bunker Creek base flows do not currently meet AWQC. | Y | Y |
| **Beaver Dam**: Presence of the beaver dam may impact channel stability, flow paths, and infiltration. | N | Y |

| Table ES-5. Summary of Issues - Operable Unit 2 | | |
|---|---|---|
| Issues | Affects Protectiveness (Y/N) | |
| | Current (now to 1 year) | Future (>1 year) |
| **Union Pacific Railroad Right-of-Way (UPRR ROW)** | | |
| **Barrier Erosion:** Motor vehicle access on gravel portions of the UPRR ROW results in erosion of barrier layers. | N | Y |
| **Milo Gulch** | | |
| **State Superfund Contract for 2001 OU2 ROD Amendment:** Lack of a SSC amendment between the USEPA and the State of Idaho prevents full implementation of the 2001 OU2 ROD Amendment, including surface water mitigation work identified for Milo Creek. | Y | Y |
| **Reed Landing Adit Flows:** Near Reed Landing, adit drainage flows into an old surface water channel and into the buried 4'x4' culvert, and eventually daylights onto a soil slope. Slope instability or erosion may occur as a result of this flow. | N | Y |
| **System Requirements:** System requires periodic maintenance to control function. | N | Y |
| **OU2 Biological Monitoring** | | |
| **Wildlife Tissue Concentrations:** Wildlife tissue metal concentrations appear to continue to be elevated in post remediated areas. | N | Y |
| **Potential Wetland Loss:** Mitigative measures should be considered for wetland loss at West Page Swamp due to expansion of Page Repository. | N | Y |
| **Vegetation:** Vegetation supportive of local bird population needs additional time to recover. | N | Y |
| **Gulch Monitoring:** Further examination and monitoring at Government, Magnet, and Deadwood Gulches is required to evaluate whether post-remediation soil lead concentrations are above levels toxic to songbirds and to determine trends in songbird lead body burdens. | N | Y |
| **Sediment Lead Levels:** Sediment lead levels within the Page Pond area appear to continue to be above toxic threshold levels to waterfowl. | N | Y |
| **Small Mammals:** Metal concentration levels in OU2 small mammals continue to be elevated above reference samples and are indicative of elevated exposure. | N | Y |
| **Soil Sampling:** Soil samples have not been routinely collected in post-remediated areas. | N | Y |

| Table ES-6. Summary of Recommendations and Follow-Up Actions – Operable Unit 2 | | | | | |
|---|---|---|---|---|---|
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
| | | | | Current (now to 1 year) | Future (>1 year) |
| **OU2 Institutional Controls Program (ICP)** | | | | | |
| **Funding:** Create irrevocable trust to provide consistent cash flow for ICP operation into perpetuity. | IDEQ | IDEQ, USEPA | 12/2009 | N | Y |
| **Disposal/ICP Repository:** Establish long-term disposal plan for ICP-generated wastes. | IDEQ, PHD, USEPA | USEPA | 12/2006 | N | Y |
| **ICP Database:** Collect information for ICP property database. | IDEQ, PHD, USEPA | IDEQ | 12/2007 | N | Y |
| **Barrier Maintenance:** Identify funding and other resources for infrastructure maintenance and improvements to protect the remedy, such as storm water controls. | Local Governments, IDEQ, USEPA | USEPA | 6/2009 | N | Y |
| **Hillsides** | | | | | |
| **Hillsides Access Controls:** Assess the need for additional access control to hillsides and gulches. Inform the public of the adverse impacts resulting from off-road use. | IDEQ ,USEPA | IDEQ, USEPA | 9/2006 | N | Y |
| **Gulches** | | | | | |
| **Biological Monitoring:** Conduct additional soil sampling for metals concentrations in areas where biomonitoring is occurring. | USFWS | USEPA | 10/2006 | N | Y |
| **Gulch Phase I Remedial Action Effectiveness Monitoring:** Complete evaluation of the Phase I remedial action effectiveness monitoring data and revise the remedial action effectiveness monitoring plan as appropriate. | IDEQ,USEPA | IDEQ, USEPA | 7/2006 | N | Y |
| **Smelterville Flats** | | | | | |
| **Biological Monitoring:** Conduct additional soil sampling for metals concentrations in north of I-90 areas where biomonitoring is occurring. | USFWS | USEPA | 10/2006 | N | Y |

| Table ES-6. Summary of Recommendations and Follow-Up Actions – Operable Unit 2 | | | | | |
|---|---|---|---|---|---|
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Smelterville Flats Phase I Remedial Action Effectiveness Monitoring:** Complete evaluation of the Phase I remedial action effectiveness monitoring data and revise the remedial action effectiveness monitoring plan as appropriate. | IDEQ, USEPA | IDEQ, USEPA | 7/2006 | N | Y |
| **Central Impoundment Area (CIA)** | | | | | |
| **State Superfund Contract (SSC) for 2001 OU2 ROD Amendment:** Continue, with the assistance of the State of Idaho, to pursue viable solutions to the SSC impasse. Once a solution is achieved, continue with implementation of the 2001 OU2 ROD Amendment. | IDEQ, USEPA | USEPA | 12/2007 | Y | Y |
| **CIA Phase I Remedial Action Effectiveness Monitoring:** Complete evaluation of the Phase I remedial action effectiveness monitoring data and revise the remedial action effectiveness monitoring plan as appropriate. | IDEQ, USEPA | IDEQ, USEPA, | 7/2006 | N | Y |
| **Page Pond** | | | | | |
| **North Channel:** Evaluate area that did not survive initial hydroseeding. Take action to re-establish vegetation and/or place a soil barrier over exposed tailings. Ensure access is limited to trail users, if appropriate. | UMG | IDEQ, USEPA | 4/2006 | Y | Y |
| **Remedial Effectiveness Monitoring Program:** Evaluate possible issues in existing Page Pond monitoring program. Review recommendations in 1999 monitoring program memorandum (CH2M HILL, 1999). Finalize monitoring program elements. | IDEQ, UMG, USEPA | IDEQ, USEPA | 4/2006 | N | Y |
| **Repository Vehicle Decontamination:** Evaluate appropriate decontamination improvements and put measures in place to reduce the potential for recontamination. | IDEQ, PHD, UMG | IDEQ, PHD, USEPA | 4/2006 | Y | Y |
| **Biological Monitoring:** Evaluate biological monitoring results and impacts related to Page Repository expansion. | IDEQ, UMG, USEPA | IDEQ, USEPA | 4/2006 | N | Y |
| **Remedy Implementation:** Complete Page Pond remedial actions. | UMG | IDEQ, USEPA | 12/2006 | Y | Y |

**Table ES-6. Summary of Recommendations and Follow-Up Actions – Operable Unit 2**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Industrial Complex** | | | | | |
| **Area 14 Remediation**: Initiate phased site characterization, remedial design and remedial action at Area 14. | USEPA | USEPA | 3/2006 | N | Y |
| **State Superfund Contract (SSC) for 2001 OU2 ROD Amendment:** Continue, with the assistance of the State of Idaho, to pursue viable solutions to the SSC impasse. Once a solution is achieved, continue with implementation of the 2001 OU2 ROD Amendment. | IDEQ, USEPA | USEPA | 12/2007 | Y | Y |
| **Central Treatment Plant (CTP)** | | | | | |
| **State Superfund Contract (SSC) for 2001 OU2 ROD Amendment:** Continue, with the assistance of the State of Idaho, to pursue viable solutions to the SSC impasse. Once a solution is achieved, continue with implementation of the 2001 OU2 ROD Amendment. | IDEQ, USEPA | IDEQ, USEPA | 12/2007 | Y | Y |
| **AMD Discharge from Reed and Russel:** Work with mine owner to address AMD conveyance issues resulting in discharge of AMD at these locations. | USEPA | USEPA | 12/2007 | Y | Y |
| **Bunker Creek** | | | | | |
| **State Superfund Contract (SSC) for 2001 OU2 ROD Amendment:** Continue, with the assistance of the State of Idaho, to pursue viable solutions to the SSC impasse. Once a solution is achieved, continue with implementation of the 2001 OU2 ROD Amendment. | IDEQ , USEPA | USEPA | 12/2007 | Y | Y |
| **Bunker Creek Phase I Remedial Action Effectiveness Monitoring:** Complete evaluation of the Phase I remedial action effectiveness monitoring data and revise the remedial action effectiveness monitoring plan as appropriate. | IDEQ, USEPA | IDEQ, USEPA | 7/2006 | N | Y |
| **Beaver Dam:** Coordinate with Idaho Department of Fish & Game (IDFG) on appropriate measures to address beaver presence. | IDEQ ,USEPA | IDEQ, USEPA | 12/2005 | N | Y |

**Table ES-6. Summary of Recommendations and Follow-Up Actions – Operable Unit 2**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Union Pacific Railroad Right-of-Way (UPRR ROW)** | | | | | |
| **Barrier Erosion:** Continue oversight monitoring of UPRR's operation and maintenance (O&M) program. | IDEQ, PHD | IDEQ, PHD | 9/2010 | N | Y |
| **Milo Gulch** | | | | | |
| **State Superfund Contract (SSC) for 2001 OU2 ROD Amendment:** Continue, with the assistance of the State of Idaho, to pursue viable solutions to the SSC impasse. Once a solution is achieved, continue with implementation of the 2001 OU2 ROD Amendment. | IDEQ, USEPA | USEPA | 12/2007 | Y | Y |
| **Reed Landing Adit Flows:** Continue discussions/negotiations with the mine owner to redirect the adit flows in the Milo drainage to the CTP for treatment. | USEPA | USEPA | 12/2005 | N | Y |
| **Permanent Access:** Secure permanent access for system maintenance. | IDEQ, USEPA | USEPA | 90/2010 | N | Y |
| **A-4 Gypsum Pond** | | | | | |
| **Vegetative Standard:** Review performance of vegetative standard at the next five-year review. It is currently estimated that this standard will be met in 2008 or 2009. | SMC | IDEQ, USEPA | 9/2010 | N | Y |
| **South Fork Coeur d'Alene River Removal and Stabilization Project** | IDEQ | USEPA | Ongoing | N | Y |
| **Observational Monitoring:** Continue informal observational monitoring of SFCDA River removal and stabilization project sites, especially after flood events. Will also include as part of Smelterville Flats Phase I Remedial Effectiveness Monitoring. | | | | | |
| **OU2 Phase I Water Quality Monitoring** | | | | | |
| **Environmental Monitoring:** Complete revision of OU2 Environmental Monitoring Plan and implement | IDEQ , USEPA | USEPA | 3/2006 | N | Y |
| **Conceptual Site Model:** Complete revised OU2 Conceptual Site Model | IDEQ, USEPA, | USEPA | 12/2006 | N | N |

**Table ES-6. Summary of Recommendations and Follow-Up Actions – Operable Unit 2**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Trend Analysis:** Complete statistical trend analysis of OU2 Phase I water quality monitoring data. | IDEQ, USEPA | USEPA | 12/2006 | N | Y |
| **Phase I Assessment:** Complete assessment of OU2 Phase I remedial actions with respect to water quality. | IDEQ, USEPA | USEPA | 7/2007 | N | Y |
| **OU2 Biological Monitoring** | | | | | |
| **Potential Wetland Loss:** Mitigative measures should be considered for wetland loss at West Page Swamp due to expansion of Page Repository. | UMG, USEPA | IDEQ, PHD, USEPA | 12/2006 | N | Y |
| **Environmental Monitoring Plan:** Incorporate biological monitoring components into revised OU2 Environmental Monitoring Plan. The following previously established activities are recommended for continued biomonitoring within OU2:<br>• Waterfowl blood collection<br>• Songbird blood collection<br>• Small mammal metals evaluation<br>• Fish metals evaluation<br>• Aquatic invertebrate collection<br>• Breeding Bird Surveys<br>• Monitoring Avian Productivity and Survivorship (MAPS)<br>• Page/Swamp Waterfowl Surveys<br>• Page Pond wetland vegetation mapping<br>In addition, the following activities are recommended to be included in future biomonitoring within OU2:<br>• Songbird histopathology<br>• Surface soil/sediment sampling<br>• Terrestrial invertebrate collection and/or invertebrate soil toxicity testing<br>• Amphibian population monitoring | USEPA | USEPA | 9/2005 | N | Y |

Table ES-7. Summary of Removal Actions – Operable Unit 3

| Site Name | Responsible Entity | Dates of Action | Description of Action |
|---|---|---|---|
| **Residential and Common-use Areas** | | | |
| Residential Yards | IDEQ ,USEPA | 1997-2002 | Partially removed lead-contaminated soils and replaced with clean soil barrier and or other protective barriers (e.g., clean gravel). From 1997-2002, actions were completed at 119 residential yards. |
| Schools/Daycares | USEPA | 1997-2001 | Partially removed lead-contaminated soils and replaced with clean soil or other protective barriers (e.g., clean gravel). Actions were completed at 7 schools and daycares. The Silver Hills Middle School was started in 1997 and additional work was completed in 1998, 2001, and 2002 due to the extremely large property size. |
| Private Drinking Water | USEPA | 1997-2002 | Provided alternate water supply to 28 residences on contaminated private wells. Alternate supplies included bottled water for11 homes, end-of-tap water treatment (water filters) for 5 homes, and municipal water hookup for 12 homes. |
| **Canyon Creek** | | | |
| Standard Mammoth Facility | ASARCO | 1997-1998 | Removal of tailings with disposal at Woodland Park Repository. Re-graded, stabilized, capped, and revegetated waste rock pile. Removed railroad grade and crossing. |
| Canyon Creek from Tamarack to below Gem | SVNRT | 1997-1998 | Time-critical removal of ~127,000 cubic yards (cy) of tailings and contaminated sediment with disposal at the Woodland Park Repository. Soils at removal areas were amended with organic materials, and then revegetated. The stream channel of Canyon Creek was stabilized with bioengineering techniques. |
| Lower Canyon Creek Floodplain | SVNRT | 1997-1998 | Time-critical removal of 472,000 cy of tailings and contaminated materials with disposal at the Woodland Park Repository. Soils at removal areas were amended with organic materials, and then revegetated. The stream channel of Canyon Creek was stabilized with bioengineering techniques. |
| Woodland Park Repository | SVNRT | 1997-1998 | Construction of an unlined repository for disposal/consolidation of removals along Canyon Creek. Repository contains approximately 600,000 cy of contaminated materials. Repository capped with native soils and revegetated. |
| Gem Portal Pilot | BLM , SVNRT, USEPA | 2000-Present | Pilot system created by Asarco (10 gallons per minute) for treatment of drainage from the Gem Portal. Continue to Evaluate Gem Portal Pilot Water Treatment System in context of Canyon Creek Water Treatment Work. |

**Table ES-7. Summary of Removal Actions – Operable Unit 3**

| Site Name | Responsible Entity | Dates of Action | Description of Action |
|---|---|---|---|
| **Ninemile Creek** | | | |
| Interstate Tailings Removal | Hecla | 1992-1993 | Removal of tailings adjacent to East Fork Ninemile Creek (EFNMC) with consolidation to a nearby uphill area. Installation of straw bales along perimeter of tailings for erosion control. |
| Interstate Mill Site | IDEQ ,SVNRT , | 1998 | Non time-critical removal of ~60,000 cy of tailings, mill debris, and contaminated sediments from the mill site and from EFNMC for 1,000 feet downstream. Disposal at an onsite repository. EFNMC stabilized with bioengineering structures in removal areas. |
| Success Mine/Mill Tailings and Waste Rock | Hecla | 1993 | Time-critical removal action included relocation and riprap armoring for ~1,600 feet of EFNMC channel; relocation of streamside tailings; placement of in-stream structures for energy dissipation; capping of tailings pile with 1-foot-thick overburden rock; installation of up gradient groundwater and surface water diversions. |
| Success Mine Site Passive Treatment | IDEQ, SVNRT USEPA , | 2000-Present | Contaminated groundwater diverted by a subsurface grout wall (approximately 1,350 feet in length) to a treatment vault. Groundwater treated using apatite. |
| East Fork Ninemile Creek Floodplain | IDEQ, SVNRT | 1994 | Time-critical removal of ~50,000 cy of flood plain tailings and contaminated sediments with disposal at the Day Rock Repository. Stream reconstruction, riparian stabilization, and revegetation. |
| Ninemile Creek Floodplain near Blackcloud | Hecla, IDEQ, | 1994 | Time-critical removal of ~44,000 cy of flood plain tailings and contaminated sediments with disposal at the Day Rock Repository. Stream reconstruction, riparian stabilization, and revegetation. |
| Day Rock Repository | Hecla, IDEQ, SVNRT | 1994 | Approximately 94,000 cy of materials from the floodplain removals were placed on top of the existing Day Rock repository and capped with native soils and growth media. |
| **Pine Creek** | | | |
| Constitution Mine and Mill Site | BLM | 1998-Present | Non-time-critical removal included removal of contaminated soils around the mill with disposal at the Central Impoundment Area (CIA), and realignment of East Fork Pine Creek away from the toe of the tailings pile. Most of the tailings and waste rock dump are on private land and have not been addressed to date. In 2002 at the Upper Constitution Site, the BLM installed a pilot mine water treatment bioreactor unit and a groundwater drain above the upper tailings pile. In 2003, the BLM made modification to the system and installed a ground water drain above the bioreactor. |

**Table ES-7. Summary of Removal Actions – Operable Unit 3**

| Site Name | Responsible Entity | Dates of Action | Description of Action |
|---|---|---|---|
| Denver Creek (includes Little Pittsburg, Hilarity, Denver and Mascot Mine) | BLM | 1996-2000 | Time-critical removal of ~5,200 cy of tailings and contaminated soils associated with the Little Pittsburg Mill. No actions have been conducted on the private portion of the pile. The mouth of Denver Creek has been undergoing stabilization and revegetation by the BLM. Re-grading at the Mascot mine was done by the mine owner, Mascot Mining, in 2002. |
| Douglas Mine and Mill Site | USEPA | 1996-1997 | Time-critical removal of two existing tailings impoundments from the flood plain of East Fork Pine Creek. 25,000 cy of contaminated materials were removed and placed into a temporary repository constructed east of Pine Creek Rd. near the mine. |
| Highland Creek Floodplain | BLM | 1999 | Time-critical removal of 8,100 cy major discrete tailings deposits along Highland Creek on public lands. |
| Highland-Surprise Mine/Mill Site (Includes Nevada Stewart Mine) | BLM | 1999 | Diversion of Highland Creek to reduce erosion of the lower waste rock dump. Most of the facilities at this site are on private land, thus no other actions have been taken to date. In 2001 and 2002, the BLM regarded the upper and lower rock dumps at Highland Surprise. Along with that effort in 2002 the BLM also regarded the Nevada Stewart rock dump. |
| Sidney (Red Cloud) Mine/Mill Site | BLM | 1997-Present | Non-time-critical removal of contaminated soils around the mill foundations with disposal at the CIA; run-on and run-off controls; and improvements to the upstream culvert on Red Cloud Creek to control flow through the site and reduce downstream erosion. Passive treatment of adit drainage with inflow prevention at the Sidney Shaft in Denver Creek. Rock dump re-graded and hydroseeded in 2000 to minimize erosion. Additional stream channel work at the toe of the dump was performed in 2002. In 2001, the BLM started pilot water treatment efforts with the Sidney Red Cloud tunnel mine discharge. In 2003, a pilot bioreactor water treatment system was installed and is continuing to be operated and monitored. |
| Amy-Matchless Mill Site | BLM | 1996-2000 | Time-critical removal of ~9,600 cy of tailings and contaminated soils in 1996 and 1997. In 1998, a non-time-critical removal action removed an additional 420 cy of residual tailings. Disturbed area covered with soil and revegetated. Mine adit was closed by backfilling. Waste rock dump re-graded and revegetated. |
| Liberal King Mine/Mill Site | BLM | 1996-2000 | Time-critical removal of ~9,400 cy of tailings and contaminated soils. In 1998, 99 cy of mill site tailings and mill wastes were removed from the mill area. In 1999, non time-critical removal of an additional 1,800 cy of tailings, re-grading backfill of a dry adit, import of growth medium, and revegetation. The 2000 actions included extensive grading and planting of riparian vegetation. There are continuing efforts to further revegetate and stabilize the stream reach with additional stream work and plantings of shrubs and trees. |

| Table ES-7. Summary of Removal Actions – Operable Unit 3 | | | |
|---|---|---|---|
| **Site Name** | **Responsible Entity** | **Dates of Action** | **Description of Action** |
| Nabob Mine/Mill Site | BLM | 1994-2000 | Soil cover over the tailings pile and a portion of mill area; fence to limit access to the mill site and tailings; channel improvements along Nabob Creek to stabilize the channel and prevent erosion of the tailings pile embankment. In 1995, the mine operator seeded and placed soil cover materials over the tailings, but success of the revegetation is limited. In 2000, the BLM started an investigation at the site drilling 20 wells around the pile and mill. Also in 2000, the BLM installed a groundwater cutoff drain above and along the side of the tailings pile. In 2001, the BLM re-graded the Nabob Mid-level rock dump. |
| **Moon Creek** | | | |
| Silver Crescent and Charles Dickens Mines | USFS | 1998-2000 | Non-time-critical removal of ~130,000 cy of tailings, waste rock, contaminated soils, and mill structures, with disposal at an onsite repository. Closure of four adits. Stream relocation and vegetative and structural rehabilitation along approximately 3,300 feet of Moon Creek, and 10 acres of riparian revegetation. . |
| Elk Creek Pond at Mouth of Moon Creek | SVNRT, USACE, USEPA | 1994; 2000 | Limited tailings removal in 1994. Clean sand was imported for a recreational beach at this swimming hole. Time-critical removal of 28,000 cy of contaminated sediments and tailings in 2000 (Liverman, 2004). |
| **Upper South Fork Coeur d'Alene River** | | | |
| Morning Mine No. 6 | Hecla | 1989; 2000 | Adit drainage directed to subsurface flow, rock-bed filter treatment system. Slaughterhouse Gulch was lined to reduce infiltration through the waste rock pile. |
| Osburn Flats | SVNRT | 1997-1998 | Removal of 133,000 cy of tailings and contaminated soil. Project also tested the application of various in situ treatments to tie up metals. |
| **Grouse Creek** | | | |
| We Like Mine | BLM | 2001-Present | The We Like Mine is in the upper part of Grouse Creek, just above the original Star Mine Rock Dump area. In 2001, the BLM started mine water investigations. In 2003, a pilot bioreactor tank water treatment system was installed and continues to operate. |
| **South Fork Coeur d'Alene River** | | | |
| South Fork Floodplain Removals | SVNRT | 1998 | Non-time-critical removals at several areas in the floodplain totaling about 128,000 cy of tailings and contaminated soils. |
| Elizabeth Park Stream Bank Stabilization | SVNRT | 1994; 1999 | The project removed 13,585 cy of tailings from the river and used the material to construct a compacted levee over 2,100 feet long on the south river bank. Additionally, 8,027 tons of riprap was placed on the riverbanks to protect them from further erosion. The project also installed in-channel stabilization, aquatic habitat features, and riparian zone enhancements. Work on the project was initiated in September 1994, and completed in May 1995. In 1999, additional river barbs were installed to enhance |

| Table ES-7. Summary of Removal Actions – Operable Unit 3 | | | |
|---|---|---|---|
| **Site Name** | **Responsible Entity** | **Dates of Action** | **Description of Action** |
| | | | aquatic life. |
| **Lower Coeur d'Alene River** | | | |
| Cataldo Mission | Coeur d'Alene Tribe | 1995 | Removal of ~700 cy of tailings and contaminated soils from traditional campground areas in the vicinity of the Cataldo Mission. |
| Cataldo Boat Ramp | IDEQ | 1996-1997 | Placement of cabled-log bank protection and brush wattling to reduce erosion, and planting of bushes in the vicinity of contaminated soils to discourage human contact with the soils. |
| Black Rock Slough Trailhead/Highway 3 Crossing | USEPA | 2001-2002 | Graded and capped access road and parking area and a trail providing access to Trail of the Coeur d'Alenes; stabilization of 125 feet of eroding river bank. |
| Killarney Lake Boat Launch | BLM | 1991-1998 | Covered contaminated shoreline with geotextile fabric overlain with 12-inch rock. Paved the floodplain area and road, covered edge areas with topsoil and sodded grass, and rebuilt concrete plank boat launch. Provided drinking well and vaulted toilets at the site. |
| Dudley Bank Stabilization | SVNRT | 1999 | Pilot bank erosion project to evaluate effectiveness of rock berms in reducing bank erosion cased by piping, or undercutting by boat wake. The project berms were constructed along 625 feet of the south bank and 720 feet of the north bank of the lower CDA River upstream of the Dudley landing. The berms were constructed with large rocks placed on a geotextile fabric to prevent fine-grained soil from being washed out and undermining the berms. The berms were about 2 feet wide and were placed from 7 to 30 feet from the top of the riverbank. Monitoring in late 2000 found that very little bank erosion had occurred and the berms have remained stable (Golder, 2001). |
| Medimont Bank Stabilization | IDEQ, Soil Conservation Service | 1994 | Placement of four types of bank erosion control: two with hay bales, two with riprap. Subsequent monitoring indicated that the hay-bale methods were not effective in this portion of the river. |
| Medimont and Rainy Hill Boat Launches | Asarco, Hecla<br>USFS | 1999 | Approximately 1,000 cy of clean aggregate capped contaminated parking and access areas, 3- to 6-inch rock placed in shallow areas to discourage children from playing in contaminated sediments, boulders placed to control traffic. |
| Thompson Lake Boat Launch | USEPA | 1999-2000 | Removal of contaminated sediments from shoreline, geotextile fabric placed against bank, and overlain with 12-inch rock. Existing unpaved parking lot rebuilt and capped with asphalt, concrete planks installed to provide boat launch. |
| Anderson Lake Boat Launch | USEPA | 1999 | Removal of contaminated sediments from shoreline, geotextile fabric placed against bank, and overlain with 12-inch rock. Existing unpaved parking lot rebuilt and capped with asphalt, concrete planks installed to provide boat launch. |
| **Trail of the Coeur d'Alenes** | UPRR | 2000- | The UPRR conducted a removal action and established a recreational trail on the |

**Table ES-7. Summary of Removal Actions – Operable Unit 3**

| Site Name | Responsible Entity | Dates of Action | Description of Action |
|---|---|---|---|
| (Union Pacific Railroad [UPRR] Wallace-Mullan Branch ROW Removal Actions) | | 2004 | UPRR ROW in OU3. See Section 5.8 of the report for more information on this removal action. |

**Table ES-8. Summary of Issues - Operable Unit 3 Removal Actions**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **Residential Areas**: Issues for Residential Area Removal Actions are similar to Remedial Actions for Residential Areas (see Table ES-11). | | |
| **Canyon Creek** | | |
| **Gem Portal Pilot:** Need to evaluate the Gem Portal pilot project in the context of the 2002 OU3 ROD and in light of other water treatment work planned for Canyon Creek and other inputs into Canyon Creek. The Gem Portal pilot project is on BLM land and the BLM is not supportive of this location for a final, long-term treatment system. | Y | Y |
| **Lower Coeur d'Alene River** | | |
| **Recontamination at Medimont and Rainy Hill Boat Launches**: Gradual recontamination of surface soil at both sites has occurred over the past 5 years due to flooding and high spring flow. | N | Y |
| **Anderson Lake Boat Launch:** Keep abreast of Hwy 97 bridge replacement adjacent to boat launch. | N | To Be Determined pending completion of bridge replacement |
| **Trail of the Coeur d'Alenes** | | |
| **Harrison Beach Sand:** Potential erosion of barrier layer may be occurring based on visual observation. | N | Y |
| **Use Patterns:** Potential unauthorized uses may result in increased exposure to contaminants of concern. | N | Y |

**Table ES-9. Summary of Recommendations and Follow-Up Actions – Operable Unit 3 Removal Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Residential and Common Use Areas** | | | | | |
| Recommendations and Follow-up Actions for Residential Area Removal Actions are similar to Remedial Actions for Residential Areas (see Table ES-12). | | | | | |
| **Canyon Creek** | | | | | |
| **Standard Mammoth Facility:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ, USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Canyon Creek from Tamarack to below Gem:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ, USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Lower Canyon Creek Floodplain:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ, USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Woodland Park Repository:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. This includes collection and evaluation of groundwater monitoring data. | IDEQ, USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Gem Portal Pilot:** Continue to evaluate pilot treatment system in context of Canyon Creek remedy. | BLM, USEPA | USEPA | Ongoing | Y | Y |
| **Ninemile Creek** | | | | | |
| **Interstate Tailings Removal:** Routine monitoring | Hecla | IDEQ, USEPA | Annually | N | N |
| **Interstate Mill Site:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ, USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Success Mine/Mill Tailings and Waste Rock:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ, USEPA | IDEQ, USEPA | 12/2009 | N | Y |

**Table ES-9. Summary of Recommendations and Follow-Up Actions – Operable Unit 3 Removal Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Success Mine Site Passive Treatment:** Continue to monitor results of the pilot study and incorporate the information into the ongoing Canyon Creek water quality treatability studies and design work. | IDEQ, USEPA | IDEQ, USEPA | 12/2009 | N | Y |
| **East Fork Ninemile Creek Floodplain:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ, USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Ninemile Creek Floodplain near Blackcloud:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ , USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Day Rock Repository:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ, USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Pine Creek** | | | | | |
| **Constitution Mine and Mill Site:** Remedial action scheduled for summer 2006. Post RA monitoring required as follow-up. Continue to monitor and operate the pilot water treatment unit. | BLM, USEPA | BLM, USEPA | Construction Scheduled for Summer 2006 | N | N |
| **Denver Creek (Includes Little Pittsburg, Hilarity, Denver Mine, and Mascot Mine):** Tailings near the confluence with Pine Creek on private land remains and needs to be evaluated in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. Continue efforts to stabilize and revegetate mouth of Denver Creek. At the Little Pittsburg Mine, surface structures are within the active channel of Denver Creek and one adit is flooded and filled with stream sediment. Hilarity mine needs revegetation and stream work and Denver Mine has open tunnels and collapsed stopes. All previous work needs to be evaluated in context of ROD and if warranted incorporate into remedial action program. | BLM, USEPA | BLM, USEPA | Based on ROD schedule | N | N |

**Table ES-9. Summary of Recommendations and Follow-Up Actions – Operable Unit 3 Removal Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Douglas Mine and Mill Site:** The mine discharge, old mill foundation area and rock dump areas will be evaluated in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. Several homes have been constructed near floodplain containing tailings. This area needs to be evaluated for human exposure and exposure to grazing animals. | USEPA | BLM, USEPA | Based on ROD schedule | N | N |
| **Highland Creek Floodplain:** Ongoing revegetation and monitoring. Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | BLM | BLM, USEPA | Based on ROD schedule | N | N |
| **Highland-Surprise (Includes Nevada Stewart Mine):** High flows in Highland Creek have eroded the base of a Highland Surprise mine dump. Ongoing effort to revegetate the lower Highland Surprise rock dump. Mine adit discharge needs to be evaluated. Nevada Stewart rock dump needs further revegetation and site needs long term management of mine water discharge. Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | BLM | BLM, USEPA | Based on ROD schedule | N | N |
| **Sidney (Red Cloud):** Continue to monitor and operate the pilot water treatment unit. Evaluate waste rock pile and adit discharge in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | BLM | BLM, USEPA | Based on ROD schedule | N | N |
| **Amy-Matchless Mill Site:** Limited revegetation and stream stabilization at the Amy site. Matchless has waste rock dumps, collapsed tunnels, and discharges that need to be evaluated in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | BLM, USEPA | BLM, USEPA | Based on ROD schedule | N | N |

**Table ES-9. Summary of Recommendations and Follow-Up Actions – Operable Unit 3 Removal Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Liberal King:** Continue efforts to further revegetate and stabilize the stream reach with plantings of shrubs and trees. Evaluate mine opening, waste rock dump, and mill site foundation area in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | BLM | BLM, USEPA | Based on ROD schedule | N | N |
| **Nabob:** Tailings remain near the Nabob Mill that need to be addressed. The BLM is continuing the site investigation and is planning to install a cover over the tailings pile in the near future. Evaluate upper and mid rock dump, mine tunnel discharge and other actions taken in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | BLM, USEPA | BLM, USEPA | Based on ROD schedule | N | N |
| **Moon Creek** | | | | | |
| **Silver Crescent and Charles Dickens:** Ongoing monitoring. | USFS | IDEQ,USEPA,USFS | Based on ROD schedule | N | N |
| **Elk Creek Pond at Mouth of Moon Creek:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ,USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Upper South Fork Coeur d'Alene River** | | | | | |
| **Morning Mine No. 6:** Routine monitoring | Hecla | IDEQ, USEPA | Annually | N | N |
| **Osburn Flats:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ,USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Grouse Creek** | | | | | |
| **We Like Mine and Star Rock Dump:** Continue to evaluate and monitor the pilot bioreactor water treatment system. Rock dump needs stabilization and revegetation. Star Rock dump needs to be evaluated in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | BLM, USEPA | BLM, USEPA | Based on ROD schedule | N | N |

**Table ES-9. Summary of Recommendations and Follow-Up Actions – Operable Unit 3 Removal Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **South Fork Coeur d'Alene River** | | | | | |
| **South Fork Floodplain Removals:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ, USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Elizabeth Park Bank Stabilization:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ,USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Lower Coeur d'Alene River** | | | | | |
| **Cataldo Mission:** Post flood monitoring. | USEPA | Coeur d'Alene Tribe, USEPA | 9/2010 | N | N |
| **Cataldo Boat Ramp:** Incorporate into remedial action program and ongoing monitoring. | USEPA | USEPA | NA | N | Y |
| **Black Rock Slough Trailhead/Highway 3 Crossing:** Remedy is functioning as intended; continue to monitor streambank. | USEPA | USEPA | Ongoing | N | Y |
| **Dudley Bank Stabilization:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ,USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Medimont Bank Stabilization:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | Coeur d'Alene Tribe | Coeur d'Alene Tribe, USEPA | Based on ROD schedule | N | N |
| **Medimont Boat Launch** – Recommend that USFS consider paving existing boat launch area and establish paved picnic site near restrooms on north side of site. Continue day use only limitation. Address bank stabilization issues. Consider establishment of overnight RV parking area. | USFS | USFS | TBD Pending Funding | N | Y |

**Table ES-9. Summary of Recommendations and Follow-Up Actions – Operable Unit 3 Removal Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Rainy Hill Boat Launch** - due to gradual recontamination from flooding and high spring flows, USFS plans to cap with asphalt. | USFS | USFS | TBD Pending Funding | | |
| **Anderson Lake Boat Launch:** The USEPA will continue to stay abreast of plans for Hwy 97 bridge replacement to the extent that this activity may influence the Superfund actions at the Idaho Department of Fish & Game's (IDFG's) Anderson Lake Facility. Pending completion of designs for the Highway 97 bridge replacement, the USEPA, the IDFG, and the Recreational Area Project Focus Team (PFT) will evaluate the potential need for additional cleanup work at this site. | USEPA | USEPA | Ongoing | N | N |
| **Trail of the Coeur d'Alenes** | | | | | |
| **Harrison Beach Sand:** Continue to monitor performance. | UPRR | Coeur d'Alene Tribe, State of Idaho | 9/2010 | N | Y |
| **Unauthorized Use Patterns:** Continue monitoring. | UPRR | Coeur d'Alene Tribe, State of Idaho | 9/2010 | N | Y |
| **TLOP:** Finalize TLOP and begin implementation. | Coeur d'AleneTribe, State of Idaho | EPA | 5/2006 | N | Y |
| **Management Agreement**: Finalize and Implement State-Tribe Management Agreement. | Coeur d'AleneTribe, State of Idaho | EPA | 5/2006 | N | Y |

**Table ES-10. Summary Activities and Remedial Actions – Operable Unit 3**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Institutional Controls Program (ICP) | PHD, IDEQ, USEPA | Yet to be established | The OU3 ICP has not yet been established, however, the PHD has met with local officials to begin discussions of program requirements, using the OU1 and OU2 ICP as a model. The OU3 ICP is expected to include several program components such as permitting, inspections, and the development of local construction regulations to be coordinated with local governments and other entities. |
| Health and Safety During Remediations | IDEQ, USEPA | Ongoing | Ensure that remedial actions are implemented safely and in accordance with applicable regulations and guidance. |
| Residential and Community Soil Remediations | IDEQ,USEPA | 2003-Present | Remediating lead- and arsenic-contaminated soil in residential yards, street rights-of-way, and commercial properties in Upper and Lower Basin communities. High-risk properties are prioritized for cleanup throughout OU3, and target area cleanup has been initiated in the communities of Mullan and Osburn. Also have provided alternate drinking water supplies for residences on contaminated private wells. |
| Coeur d'Alene Lake Fish Investigation | USEPA | 2002-2003 | Collaborative study to address data gap in human heath risk assessment. Resulted in IDHW and Coeur d'Alene Tribe joint issuance of fish consumption advisory in June 2003. |
| **Lower Basin Recreational Areas:** | | | |
| East of Rose Lake Boat Launch | USEPA | 2003-2004 | Created clean recreational area - capped contaminated soil in existing parking lot, re-built boat launch, stabilized bank to reduce erosion and human exposure to contaminated river bank. |
| Highway 3/Trail of the Coeur d'Alenes Crossing | USEPA | 2003-2004 | Created clean recreational area - built upon previous removal action conducted in 2000, capped contaminated soil with combination of pavement, topsoil/fabric/grass cap. |
| Informational Signage | USEPA | 1991; 1999; 2004 | Information signage was installed at nine recreational sites where implementation of effective, low maintenance remedial action would be difficult. Signs were initially installed in 1991 and updated in 1999 as part of Basin time critical removal actions. |
| Evaluation of sites | USEPA, USFWS | Ongoing | Continue to evaluate and identify additional Lower Basin recreational areas that may require cleanup. |
| Migratory Songbird Study | USEPA, USFWS | Ongoing | Conducting study provide site-specific data for incorporation into a risk analysis to determine if songbirds are at risk of lead exposure and to determine the lead concentrations in soil associated with potential adverse effects. |

**Table ES-10. Summary Activities and Remedial Actions – Operable Unit 3**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Canyon Creek Water Treatment Pilot Study | USEPA | 2004-Present | Testing for Phase I of the treatability study was completed in December 2004. Phase II is underway and consists of pilot-scale testing of selected active technologies and both bench- and pilot-scale testing of "passive" technologies that could address partial surface or groundwater treatment. |
| Agricultural to Wetland Conversions | USEPA | Ongoing | Identify potentially interested landowners. |
| Soil Amendment Study | IDEQ, USEPA, USFWS | 2001-2004 | Two-pronged collaborative study using both lab and field studies to evaluate effectiveness of phosphate-based soil amendments to reduce bioavailability and leachability of heavy metals. |
| Silver Dollar Growth Media Pilot | IDEQ | 2002-Present | Continue to Evaluate Growth Media Pilot Project (See text in Section 5.5). |
| Spokane River, Washington Recreational Areas | USEPA | 2002-Present | Design at Starr Road complete in 2005, and remedial actions will be implemented in 2006. Design for Island Complex will be completed in 2006, and the remedial action initiated in 2006. |
| Sisters Site | IDEQ, USEPA | 2004-2005 | In 2004, the USEPA initiated the remedial design for this site for implementation by the State of Idaho during the summer of 2005. Completed remediation in 2005. |
| Rex Mine and Mill | BLM, USEPA | 2002-2004 | Stabilization of waste rock dump and stream by-pass around tailings by BLM. In 2004 USEPA initiated the remedial design for this site which included collection of pre-design data. The remedial design is expected to be complete by the spring of 2006 with construction scheduled to start in the summer of 2006. Construction is scheduled to be completed by 2007. |
| Constitution Site | USEPA, BLM | 2004-2005 | In 2004 USEPA and BLM initiated the remedial design for this site for implementation of the remedial action in 2005. Construction of the remedy is scheduled to start in the fall of 2005 and be completed by 2006. |
| Golconda Site | IDEQ, USEPA | 2004-2005 | In 2004 USEPA initiated the remedial design for this site for implementation of an interim action by the State of Idaho during the summer of 2005. The overall site remedy construction is scheduled to begin in the summer of 2006. |
| Coeur d'Alene Mine and Mill | Coeur Silver Valley | 2001- | Prior to demolition, all salvageable metal materials were removed, decontaminated and taken offsite. The mill building was pulled apart using an excavator. A few large timbers were decontaminated and saved. The remainder of the demolition materials, primarily wood, was fed into a chipper which reduced volume by 90 percent. Once mill building was removed, the foundation and ore bins were cleaned. Fencing at the site was repaired and improved. Large boulders were placed at selected potential access points. Signs were placed at appropriate locations. |

**Table ES-10. Summary Activities and Remedial Actions – Operable Unit 3**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Silver Summit Mill | Sunshine Mining Company | 2001 | Labeled and removed all containers of solvents, lubricants, processing chemicals, paint and trash. A PCB investigation was conducted for all transformers and oil switches located throughout the site and none was found. Access controls were established. |
| Big Creek Repository | IDEQ, USEPA | 2002-Present | Established repository on former Sunshine Mining Co. tailings pond for contaminated soil and other materials removed during implementation of the remedial actions. |
| OU3 Basin Environmental Monitoring Plan (BEMP) | USEPA | 2004-Present | OU3-wide environmental monitoring plan designed to monitor and evaluate progress of remedy in terms of improving environmental conditions. Results available on www.storet.org. |
| Coeur d'Alene Lake | Coeur d'Alene Tribe, IDEQ | 2002-Present | Fish consumption study, preparation of Lake Management Plan (LMP) implementation of Lake Environmental Monitoring Plan (LEMP). |

| Table ES-11. Summary of Issues - Operable Unit 3 Remedial Actions | | |
|---|---|---|
| Issues | Affects Protectiveness (Y/N) | |
| | Current (now to 1 year) | Future (>1 year) |
| **Institutional Controls Program (ICP):** An OU3 ICP has not yet been established and remedial actions are being implemented. | Y | Y |
| **Residential and Common Use Remediation:** | | |
| **Lead Health Intervention Program (LHIP):** Funding for this program has been discontinued by ATSDR. The IDEQ funded LHIP activities in 2004. Annual blood lead screening participation rates have declined in the last three years. | N | Y |
| **Infrastructure:** Infrastructure upgrades and maintenance are critical to long-term remedy success. Resources to repair and install infrastructure that will help prevent recontamination of protective barriers need to be identified. State and federal governments will need to assist with the identification of resources. | Y | Y |
| **Migratory Songbird Study** | | |
| **Data Gaps:** Did not assess areas with soil concentrations less than 1,100 mg/kg (dw) and so potential adverse effects on songbirds is not known when the songbirds are inhabiting areas with soil lead less than 1,100 mg/kg (dw). | N | N |
| **Sub-lethal Effects:** Impact of sub-lethal effects on songbirds is unclear. | N | N |
| **Population-level Impacts:** Did not assess potential population-level impacts, particularly at areas where might expect clinical effects on individual songbirds (e.g., Cataldo, Strobl based on liver lead concentrations in song sparrows). | N | N |
| **Canyon Creek Water Treatment Pilot Study** | | |
| **Treatment Technologies:** Need to identify treatment technologies that will meet the goals of the 2002 OU3 ROD at the lowest possible long-term operation and maintenance (O&M) cost. | Y | Y |
| **Agriculture to Wetlands** | | |
| **Identify Landowners:** Need to identify landowners interested in agricultural to wetland conversion. | N | Y |
| **Soil Amendment Study** | | |
| **Further Study:** Further study is needed to resolve questions concerning optimal application rates, long-term stability, ecological impacts, and potential seasonal effects. | N | N |

| Table ES-11. Summary of Issues - Operable Unit 3 Remedial Actions | | |
|---|---|---|
| Issues | Affects Protectiveness (Y/N) | |
| | Current (now to 1 year) | Future (>1 year) |
| **Repository**<br>**New Sites:** Need for additional repository space. | N | Y |
| **Coeur d'Alene Lake**<br>**Lake Eutrophication:** Control of lake eutrophication and potential release of metals from contaminated sediments. | Y | Y |

**Table ES-12. Summary of Recommendations and Follow-up Actions – Operable Unit 3 Remedial Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 yr) | Future (> 1 year) |
| **Secure Funding for Full Implementation of Interim OU3 Remedy**<br>EPA Region 10 has received funding for implementation of the OU3 human health remedy. The Region will continue to work with EPA Headquarters and other parties to secure funding for full implementation of the 2002 OU3 ROD. | USEPA | USEPA | Ongoing | Y | Y |
| **Institutional Controls Program (ICP)**<br>Establish an OU3 ICP as soon as possible to protect barriers from disturbance and minimize recontamination. | IDEQ, PHD, USEPA | USEPA | 12/2006 | Y | Y |
| **Health and Safety During Remediations**<br>Continue successful implementation of safety programs as evidenced by no lost time or injuries reported. | IDEQ, USEPA | USEPA | Ongoing | Y | Y |
| **Residential and Community Area Remediation** | | | | | |
| **Human Health Exposure Profile:** Complete an updated exposure profile for OU3. | IDEQ, USEPA | USEPA | 12/2006 | N | Y |
| **Implement Actions:** Continue to implement remedial actions. | IDEQ | USEPA | 12/2009 | Y | Y |
| **Lead Health Intervention Program (LHIP):** Identify additional funding sources for the LHIP. Continue to evaluate options for increasing participation in annual blood lead screening program. | IDEQ, PHD, USEPA | USEPA | 12/2005 | N | Y |
| **Infrastructure:** Work with Basin communities and state and federal agencies on an infrastructure plan to ensure remedy success. | IDEQ | PHD, USEPA | 12/2008 | Y | Y |
| **Coeur d'Alene Lake Fish Investigation** | | | | | |
| **Future Sampling:** Evaluate the need for additional fish tissue sampling and testing in Coeur d'Alene Lake to assess the applicability of the current fish consumption advisory. | Coeur d'Alene Tribe and State of Idaho | Coeur d'Alene Tribe and State of Idaho | 9/2010 | N | Y |

**Table ES-12. Summary of Recommendations and Follow-up Actions – Operable Unit 3 Remedial Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 yr) | Future (> 1 year) |
| **Lower Basin Recreational Areas** | | | | | |
| **Remedial Action Effectiveness Monitoring**: Implement remedial action effectiveness monitoring programs at the East of Rose Lake Boat Launch and the Highway 3/Trail of the Coeur d'Alenes crossing sites. | USEPA | USEPA | Ongoing | N | N |
| **East of Rose Lake Boat Launch:** Continue remedial action effectiveness monitoring. | USEPA | USEPA | 9/2010 | N | Y |
| **Highway 3/Trail of the Coeur d'Alenes Crossing:** Continue remedial action effectiveness monitoring. | USEPA | USEPA | 9/2010 | N | Y |
| **Informational Signage:** Replace damaged signs as needed. | USEPA | USEPA | Ongoing | N | N |
| **Additional Areas:** Identify and evaluate additional Lower Basin recreational areas that may require cleanup. | USEPA | USEPA | Ongoing | N | N |
| **Migratory Songbird Study** | | | | | |
| **Risk Analysis:** Conduct a risk analysis with data generated from the migratory songbird study, and assess any data gaps identified. | USEPA | USEPA | 9/2010 | N | Y |
| **Survey and MAPS:** Continue the Breeding Bird Survey and MAPS route through the Lower Coeur d'Alene River Basin to determine bird diversity. Assist managers in riparian habitat remedial decisions. | USEPA | USEPA | Ongoing | N | Y |
| **Canyon Creek Water Treatment Pilot Study** | | | | | |
| **Treatment Technologies:** Complete pilot studies to evaluate active and passive technologies to achieve the goals of the 2002 OU3 ROD. | USEPA | USEPA | Ongoing | Y | Y |
| **Agricultural to Wetland Conversions** | | | | | |
| **Identify Landowners**: Identify landowners interested in agricultural to wetland conversion. | USEPA | USEPA | Ongoing | N | Y |
| **Soil Amendment Study** | | | | | |
| **Further Studies**: Evaluate findings of follow-up study and, as appropriate, conduct further evaluations of technical feasibility of soil amendments. | IDEQ, USEPA | USEPA | 9/2010 | N | N |

**Table ES-12. Summary of Recommendations and Follow-up Actions – Operable Unit 3 Remedial Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 yr) | Future (> 1 year) |
| **Silver Dollar Growth Media Pilot** | | | | | |
| **Further Monitoring:** Continue annual monitoring and use results to help develop vegetative covers for future remedial actions. | IDEQ | IDEQ | Ongoing | N | N |
| **Upper Basin Mine and Mill Sites** | | | | | |
| Complete remedial designs (RDs) at Rex and Golconda sites. Initiate construction of the remedy at Constitution, Rex, and the Golconda. Identify additional Mine and Mill sites to begin RD. | BLM , IDEQ, USEPA | BLM, USEPA, IDEQ | RD completion at 2 sites 9/2005. RA start at 2 sites 10/2005 | N | Y |
| **Repositories** | | | | | |
| **Big Creek:** Continue to implement remedial actions at Big Creek Repository. | IDEQ , USEPA | IDEQ, USEPA | 9/2010 | N | Y |
| **New Sites**: Continue search and evaluation of potential repository sites. | IDEQ, USEPA | IDEQ, USEPA | 9/2007 | N | Y |
| **OU3 Basin Environmental Monitoring Plan (BEMP)** | | | | | |
| Continue to implement the BEMP. | USEPA | USEPA | Ongoing | N | Y |
| **Remedial Action Effectiveness Monitoring** | | | | | |
| Continue implementation of remedial action effectiveness monitoring at recreational areas and include RA effectiveness monitoring in the designs and implementation plans for ecological-related remedial actions. | USEPA and/or implementing entity | USEPA | Ongoing | N | N |
| **Coeur d'Alene Lake** | | | | | |
| **Lake Eutrophication:** Complete Lake model. | Coeur d'Alene Tribe, USGS | USEPA | 12/2006 | Y | Y |
| **Lake Management Plan:** Complete and initiate Lake Management Plan. | Coeur d'Alene Tribe, IDEQ | USEPA | 4/2006 | N | Y |

# Five-Year Review Summary Form

## Five-Year Review Summary Form

| SITE IDENTIFICATION | | |
|---|---|---|
| **Site name *(from WasteLAN)*:** Bunker Hill Mining and Metallurgical Complex | | |
| **USEPA ID *(from WasteLAN)*:** IDD048340921 | | |
| **Region:** 10 | **States: Idaho & Washington:** | **Counties: Shoshone, Kootenai, Benewah Counties in Idaho, and Spokane County in Washington** |
| **SITE STATUS** | | |
| **NPL status:** ■ Final ☐ Deleted ☐ Other (specify) | | |
| **Remediation status** (choose all that apply): ■ Under Construction ■ Operating ☐ Complete | | |
| **Multiple OUs?*** ■ YES ☐ NO | **Construction completion date:** __/__/____ | |
| **Has site been put into reuse?** ☐ YES ☐ NO + **Portions of the site have been put into reuse.** | | |
| **REVIEW STATUS** | | |
| **Lead agency:** ■ USEPA ☐ State ☐ Tribe ☐ Other Federal Agency | | |
| **Author name:** USEPA Region 10 | | |
| **Author title:** | **Author affiliation:** | |
| **Review period:**** 08/01/2004 to 04/30/2005 | | |
| **Date(s) of site inspection:** 10/19/2004 | | |
| **Type of review:** ■ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion | | |
| **Review number:** ☐ 1 (first) ■ 2 (second) ☐ 3 (third) ☐ Other (specify) ________ | | |
| **Triggering action:** ☐ Actual RA Onsite Construction at OU #___ ☐ Actual RA Start at OU# ___ ☐ Construction Completion ■ Previous Five-Year Review Report ☐ Other (specify) | | |
| **Triggering action date *(from WasteLAN)*:** 09/27/2000 | | |
| **Due date *(five years after triggering action date)*:** 09/27/2005 (Due to a request by the Idaho Congressional delegation, the public comment period was extended for an additional 30 days, which caused the completion of this report to be one month late). | | |

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

# Five-Year Review Summary Form

**Issues:**

See Executive Summary Tables ES-2, ES-5, ES-8, and ES-9.

**Recommendations and Follow-up Actions:**

See Executive Summary Tables ES-3, ES-6, ES-9, and ES-12.

**Protectiveness Statements:**

**Operable Unit 1 (OU1).** The remedy being implemented in OU1 is expected to be protective of human health and the environment upon completion, provided that follow-up actions identified in the final report are implemented.

Although the remedy has not been fully implemented, environmental data (except right-of-way [ROW] data) indicate that the remedy is functioning as intended by the Record of Decision (ROD). As remediation nears completion, soil and house dust lead concentrations are declining, lead intake rates have been substantially reduced, and blood lead levels have achieved their remedial action objectives (RAOs). House dust lead levels are declining but some individual homes continue to exceed lead concentrations of 1,000 milligrams per kilogram (mg/kg). For ROWs, data indicate that lead levels are stabilizing but are continuing to slowly increase over time.

There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy; however, due to the history of flooding in the area, it is possible that future flood events may affect remedy protectiveness. In addition, the ability of the local communities to improve and maintain infrastructure to protect the remedy is a concern. Infrastructure improvements and ROW recontamination will be evaluated in the next five-year review, as well as determining whether all the RAOs have been met once the remedy is completed.

**Operable Unit 2 (OU2).** The remedy being implemented in OU2 is expected to be protective of human health and the environment upon completion, and in the interim, human health exposure pathways that could result in unacceptable risks are being controlled.

In 1995, with the bankruptcy of the Site's major Potentially Responsible Party (PRP), the USEPA and the State of Idaho defined a path forward for phased remedy implementation in OU2. Phase I of remedy implementation includes extensive source removal and stabilization efforts, all demolition activities, all community development initiatives, development and initiation of an Institutional Controls Program (ICP), future land use development support, and public health response actions. Also included in Phase I are additional investigations to provide the necessary information to resolve long-term water quality issues, including technology assessments and pilot studies, evaluation of the success of source control efforts, development of site-specific water quality and effluent-limiting performance standards, and development of a defined operation and maintenance (O&M) plan and implementation schedule. Interim control and treatment of contaminated water and acid mine drainage (AMD) is also included in Phase I of remedy implementation. Phase I remediation began in 1995, and source control and removal activities are near completion.

Since beginning the implementation of Phase I in 1995, a significant amount of remediation work has been conducted. As summarized in Table 4-1 of this report, over 3.3 million cubic yards of contaminated waste have been removed and consolidated onsite in engineered closure areas (the Smelter and Central Impoundment Area Closures). The use of geomembrane cover systems on these closure areas effectively removes these contaminated wastes from direct contact by humans and biological receptors. Consolidating these wastes in engineered closures also substantially reduces the exposure pathway to the surface water and groundwater environment in comparison to pre-remediation site conditions.

Also, as summarized in Table 4-1, over 800 acres of property within OU2 have been capped to eliminate direct contact with residual contamination that remains in place within some areas of OU2. In addition, the revegetation work conducted as part of the Phase I remedial actions has substantially controlled erosion and has significantly improved the visual aesthetics of OU2. The success of the Phase I revegetation efforts is providing improved habitat for wildlife that was largely absent for decades in many areas of the hillsides and Smelterville Flats.

All of these efforts have reduced or eliminated the potential for humans to have direct contact with soil/source contaminants, have reduced opportunities for transport of contaminants by surface water and air, and are expected to provide surface and groundwater quality improvements over time throughout the Site.

Phase II of the OU2 remedy will be implemented following completion of source control and removal activities and evaluation of the impacts of these activities on meeting water quality improvement objectives. Phase II will consider any shortcomings encountered in implementing Phase I and will specifically address long-term water quality and environmental management issues. In addition, the ICP and future development programs will be reevaluated as part of Phase II.

The effectiveness evaluation of the Phase I source control and removal activities to meet the water quality

# Five-Year Review Summary Form

improvement objectives of the 1992 OU2 ROD will be used to determine appropriate Phase II implementation strategies and actions. In addition, although the 1992 OU2 ROD goals did not include protection of ecological receptors, additional actions may be considered within the context of site-wide ecological cleanup goals. Both ROD and SSC amendments are required prior to implementation of Phase II remedial actions.

In addition to evaluating Phase I actions and identifying possible Phase II actions, a State Superfund Contract (SSC) amendment that allows for the full implementation of the 2001 OU2 ROD Amendment needs to be negotiated and signed. Time-critical components of this ROD amendment were implemented to prevent catastrophic failure of the Central Treatment Plant (CTP) and discharges of AMD to Bunker Creek and the South Fork of the Coeur d'Alene River. Until an SSC is signed, however, control and treatment of AMD and its impact on water quality will continue to be an issue. The USEPA and the State of Idaho continue to discuss the SSC amendment and the long-term obligations associated with the mine water remedy.

**Operable Unit 3.** The OU3 ROD is a 30-year cleanup plan that was published by the USEPA in September 2002. Therefore, remedy implementation has been ongoing for approximately 3 years and a protectiveness determination of the OU3 remedy cannot be made until further information is obtained. This additional information will be collected during the implementation of the remedy and through the completion of studies that support the remedy. For the human health remedy being implemented in the OU3 residential and community areas, including identified recreational areas, the remedy is expected to be protective of human health and the environment upon completion. In the interim, exposure pathways that could result in unacceptable risks are being controlled. OU3 ecological remedial actions have not yet been implemented. Protectiveness of the OU3 remedy will be evaluated in the next five-year review.

# 1 Introduction

The United States Environmental Protection Agency (USEPA) Region 10 has completed its second, site-wide review of the Bunker Hill Mining and Metallurgical Complex Superfund Facility (the "Bunker Hill Superfund Site" or "Site") located within northern Idaho, sections of the Coeur d'Alene Reservation, and northeastern Washington. This review was conducted from August 2004 through April 2005. The purpose of this review was to evaluate whether the Superfund remedies that have been or will be implemented at the Site pursuant to Records of Decision (RODs) and other Superfund decision documents are or will be protective of human health and the environment. Projects implemented with Clean Water Act funds were outside the scope of this review.

Reviews of Superfund remedies are required every five (5) years at Superfund sites where hazardous substances remain onsite above levels that allow for unlimited use and unrestricted exposure. This five-year review report documents the methods, findings, and conclusions of this second, site-wide review of the Bunker Hill Superfund Site remedies, and identifies issues found during the review and recommendations to address them.

The text and summary tables in the Executive Summary provide an overview of the entire second, five-year review report. This section provides an overview of the five-year review statutory requirements, the process for conducting this review, and the relevant guidance and decision documents that were used in preparing this report. The remainder of the report is organized as follows:

- Section 2: Site Background
- Section 3: Review of Selected Remedies for Operable Unit 1
- Section 4: Review of Selected Remedies for Operable Unit 2
- Section 5: Review of Selected Remedies for Operable Unit 3
- Section 6: Findings and Recommendations
- Section 7: Statement of Protectiveness
- Section 8: Next Five-Year Review

## 1.1 Statutory Requirements

The USEPA has prepared this five-year review report pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and the National Oil and Hazardous Substances Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial actions no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report the Congress a list of facilities for which*

> *such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The USEPA interpreted this requirement further in the NCP (40 CFR §300.430(f)(4)(ii)) which states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

Since some of the remedies implemented at the Bunker Hill Superfund Site resulted in hazardous substances remaining onsite above levels that allow for unlimited use and unrestricted exposure, five-year reviews of the Site must be completed to meet the above statutory requirements.

The first five-year review of the Bunker Hill Superfund Site remedies resulted in two separate five-year review reports: one for Operable Unit 1 (OU1) (USEPA, 2000b) and the other for Operable Unit 2 (OU2) (USEPA, 2000a). The USEPA Region 10 published these reports in September 2000, approximately 5 years after initiation of the first remedial action at the Site. This five-year review is the second evaluation of remedy performance of OUs 1 and 2. It also focuses for the first time on the remedies for OU3; however, the large majority of the OU3 remedies have yet to be implemented.

## 1.2 Five-Year Review Process

This second five-year review was conducted from August 2004 through April 2005 by the USEPA Region 10 Bunker Hill/Coeur d'Alene team and their contractor CH2M HILL, and the Idaho Department of Environmental Quality (IDEQ) and their contractor TerraGraphics. Sections of this report were contributed by the Panhandle Health District (PHD), the Coeur d'Alene Tribe, the U.S. Fish and Wildlife Service (USFWS), the U.S. Forest Service (USFS), the Idaho Department of Fish and Game (IDFG), the U.S. Army Corps of Engineers (USACE), and the U.S. Bureau of Land Management (BLM).

The review was conducted and the report prepared in accordance with USEPA guidance (USEPA, 2001b) and site-specific conditions at the Bunker Hill Superfund Site. The review process and preparation of this report included a number of steps.

### 1.2.1 Information Gathering

The first step included gathering site-related information from the following sources:

- Review of the first five-year review reports for OUs 1 and 2 (USEPA, 2000a and 2000b);
- Review of remedies selected in the Site RODs, as amended or modified (see Section 1.3.1);
- Review and assessment of relevant monitoring data and remedy completion reports, including Potentially Responsible Party (PRP) reports;
- Review of operations and maintenance (O&M) records;

- Onsite inspections;
- Interviews with various individuals familiar with specific remedial activities; and
- Notification and solicitation of comments from the public and other interested parties.

### 1.2.2 Technical Assessment

The second step was to use the information gathered from the first step, and conduct a technical assessment of remedy performance and conformance with ROD requirements, performance standards, and cleanup goals.

The technical assessment included evaluating the following three key questions for each remedial action or activity that is under construction, operating, completed, or in the case of many OU3 remedial actions or activities, to be completed in the future:

> **Question A**: Is the remedy functioning as intended by the decision documents (e.g., RODs and Explanation of Significant Differences [ESD] documents)?
>
> **Question B**: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?
>
> **Question C**: Has any other information come to light that could call into question the protectiveness of the remedy?

After evaluation of the above three questions, answers were documented in the five-year review report.

### 1.2.3 Issues and Recommended Follow-up Actions

The third step was to identify and document any issues and/or recommended follow-up actions required for each remedial action or activity. This included determining whether the issue or follow-up action would affect the protectiveness of the remedy within the next year (current) or in the future (more than one year). In certain cases, a determination was made that an issue or follow-up action was not currently affecting the remedy, but if not dealt with in the future, it could affect long-term remedy protectiveness. For example, the OU2 hillsides remedy is currently performing as expected per decision documents, but if adverse impacts from off-road vehicle-use are not controlled, protectiveness of the hillsides remedy in the future could be compromised.

Another example is the OU2 biomonitoring program. Since the 1992 OU2 ROD (USEPA, 1992) goals did not include protectiveness of ecological receptors, the OU2 biological monitoring issues and follow-up actions indicate that monitoring results do not affect current remedy protectiveness. However, because additional OU2 remedial actions may be considered within the context of site-wide ecological goals, the biological monitoring results may affect the protectiveness of the remedy in the future.

Another example involves certain OU3 removal actions and pilot studies that were conducted in Upper Basin tributaries prior to the release of the 2002 OU3 ROD (USEPA, 2002). These actions are currently performing per their decision documents (e.g., CERCLA action memorandums); however, they must be evaluated in context with the larger OU3 remedial action program in the future to ensure that water quality improvement goals across the Site (see Section 5.4 of this report) are met.

This step also included identifying the entities responsible for conducting and overseeing each follow-up action, and when these actions are to be completed.

### 1.2.4 Determining Remedy Protectiveness for Each Operable Unit

The next step was to determine the remedy protectiveness of each operable unit at the Site. In general, if the answers to the above Questions A, B, and C were *yes, yes,* and *no,* respectively, then the remedy was considered protective. However, if the answers to the three questions were other than *yes, yes,* and *no,* depending on the elements that affect each question, the remedy may be one of the following:

- Protective;
- *Will be protective once the remedy is completed;*
- Protective in the short-term (current to 1-year); however, in order for the remedy to be protective in the long-term (greater than 1-year), follow-up actions need to be taken;
- Not protective, unless the following action(s) are taken in order to ensure protectiveness; or
- Protectiveness cannot be determined until further information is obtained.

Even if there is a need to conduct further actions, it does not mean that the remedy is not protective. Normally, the remedy is considered as not protective if:

- An immediate threat is present (e.g., exposure pathways that could result in unacceptable risks are not being controlled);
- Migration of contaminants is uncontrolled and poses an unacceptable risk to human health or the environment;
- Potential or actual exposure is clearly present or there is evidence of exposure (e.g., institutional controls are not in place or not enforced and exposure is occurring); or
- The remedy cannot meet a new cleanup level and the previous cleanup level is outside of the risk range.

### 1.2.5 Community Involvement

An iterative step in the five-year process was involving community members and other interested parties in the five-year review process. Notification that the USEPA was conducting a site-wide five-year review began in the summer of 2004, followed by periodic updates on the progress of the review and opportunities for public input. General public notification was accomplished through fact sheets, the Coeur d'Alene Basin Bulletin, and the USEPA Region 10 website. Direct notification was accomplished via letters, e-mails, and presentations to a number of organizations including the Coeur d'Alene Basin Environmental Improvement Project Commission (Basin Commission), the Basin Commission's Technical Leadership Group (TLG), and the Basin Commission's Citizens

Coordinating Council (CCC). Telephone interviews were conducted with the Council Chairs of Benewah, Kootenai and Shoshone Counties, and with the mayors of the cities and towns within the Site.

Under the USEPA's five-year review guidance, a public review of the draft report is not required. However, given the high level of interest in this Site, the USEPA decided to make the draft report available for pubic review and comment. In June 2005, open houses were held in East Rose Lake, Wallace, Kellogg, and Coeur d'Alene, Idaho, and in Spokane, Washington. These open houses provided the opportunity for community members and other interested parties to talk with the USEPA and the State of Idaho staff about the five-year review process and draft report findings.

The public review and comment period started on June 1, 2005. The USEPA originally scheduled the comment period to be 30 days in order to meet the statutory requirement of completing the five-year review report by September 27, 2005. However, after receiving a request from the State of Idaho's Congressional delegation, the USEPA extended the public review and comment period another 30 days to July 30, 2005.

### 1.2.6 Addressing Comments and Finalizing the Report

The last step in the process was addressing comments received during the 60-day public comment period, and finalizing the report. All comments received were taken into consideration and incorporated into this final report to the extent possible. All comments and responses to comments (Responsiveness Summary) are included in the Appendix A CD-ROM. Hard copies of the complete Responsiveness Summary can also be obtained from EPA Region 10 and by visiting one of the Site's Information Repositories (see Section 1.3.2 of this report).

The conclusions of this five-year review process are summarized in this final report along with issues and recommendations for future actions to be taken at the Site, a statement of the level of protectiveness of Site remedies, and a schedule for the next five-year review.

## 1.3 Relevant Guidance and Decision Documents

### 1.3.1 Guidance and Decision Documents

The USEPA guidance document titled *Comprehensive Five-Year Review Guidance* (USEPA, 2001b) was used for the preparation of this five-year review report.

The key USEPA decision documents relevant to the Site's Selected Remedies include the three Site RODs and the remedy change documents that were prepared as the OU2 remedy was being implemented. Per CERCLA, as amended, remedy changes are required to be formally documented either in an amendment to the ROD or in an ESD. The USEPA decision documents that define the selected remedies for the Site are as follows:

- Record of Decision, Bunker Hill Mining and Metallurgical Complex, Residential Soils (OU1), Shoshone County, Idaho, August 1991 (USEPA, 1991).
- Record of Decision, Bunker Hill Mining and Metallurgical Complex, Non-populated Areas (OU2), Shoshone County, Idaho , September 1992 (USEPA, 1992).

- Amendment to the Record of Decision for the Bunker Hill Mining and Metallurgical Complex (Non-Populated Areas) Superfund Site (OU2), September 3, 1996. Updates the remedy for principal threat materials (PTMs) from stabilization to containment to promote remedy cost-effectiveness (USEPA, 1996a).
- Explanation of Significant Differences for Revised Remedial Actions at the Bunker Hill Superfund Site (OU2), Shoshone County, Idaho: two separate ESDs, January 1996 and April 1998. The two ESDs document the revisions to 19 separate remedial actions in OU2. The revisions were implemented to ensure that the overall OU2 remedy maximizes the benefit to the environment, is cost-effective, and is responsive to the community concerns while maintaining or increasing the level of human health and environmental protection (USEPA, 1996b and 1998).
- Amendment to the 1992 OU2 ROD to address acid mine water drainage (AMD) from the Bunker Hill Mine, December 2001 (USEPA, 2001).
- Record of Decision, Bunker Hill Mining and Metallurgical Complex, Operable Unit 3 (Coeur d'Alene Basin), September 2002 (USEPA, 2002).

### 1.3.2 Obtaining Decision Documents, the Final Report, and the Responsiveness Summary

The above remedy decision documents (see Section 1.3.1); this final version of the second, five-year review report; and the complete Responsiveness Summary (comments and responses to comments) can be obtained via the following:

- Visiting the USEPA Region 10 website for an electronic version of this final report and the complete Responsiveness Summary at: http://yosemite.epa.gov/r10/cleanup.nsf/bh/five+year+reviews
- Calling 1-800-424-2709 to request a hard copy or CD-ROM copy of this final report and/or the complete Responsiveness Summary; and/or
- Visiting one of the Site's eight information repositories listed below.

**Box Information Repositories:**

USEPA Seattle Office
Superfund Records Center
1200 Sixth Avenue
Seattle, WA 98101
206-553-4494

Pinehurst Kingston Library
107 Main Avenue
Pinehurst, ID 83850
208-682-3483

Kellogg Public Library
16 West Market Avenue
Kellogg, ID 83827
208-786-7231

**Basin Information Repositories:**

USEPA Seattle Office
Superfund Records Center
1200 Sixth Avenue
Seattle, WA 98101
206-553-4494

Coeur d'Alene Field Office, USEPA
1910 Northwest Boulevard, Suite 208
Coeur d'Alene, ID 83814
208-664-4588

Wallace Public Library
415 River Street
Wallace, ID 83873
208-752-4571

Harrison City Hall
100 Frederick Avenue
Harrison, ID 83833
208-689-3212

North Idaho College Library
1000 Garden Avenue
Coeur d'Alene, ID 83814
208-769-3355

Spokane Public Library
906 West Main Avenue
Spokane, WA 99201-0976
509-444-5336 for reference desk – ask for Dana Dalrymple

## 1.4 References

U.S. Environmental Protection Agency (USEPA). 2002. *Record of Decision, Bunker Hill Mining and Metallurgical Complex Operable Unit 3 (Coeur d'Alene Basin), Shoshone County, Idaho.* USEPA DCN: 2.9. September 2002.

USEPA. 2001a. *Record of Decision Amendment: Bunker Hill Mining and Metallurgical Complex Acid Mine Drainage, Smelterville, Idaho,* USEPA/541/R-02/105. USEPA ID: IDD048340921. December 10, 2001.

USEPA. 2001b. *Comprehensive Five-Year Review Guidance.* USEPA 540-R-01-007. June 2001.

USEPA. 2000a. *First 5-Year Review of the Non-Populated Area Operable Unit, Bunker Hill Mining and Metallurgical Complex, Shoshone County, Idaho.* USEPA Report. September 28, 2000.

USEPA. 2000b. *Bunker Hill Populated Areas Operable Unit First Five Year Review Report.* Seattle, WA. USEPA Region 10. September 27, 2000.

USEPA. 1998. *Explanation of Significant Differences for Revised Remedial Actions at the Bunker Hill Superfund Site OU2, Shoshone County, Idaho.* USEPA/ESD/R10-98/037. USEPA ID: IDD048340921. April 1998.

USEPA. 1996a. *Amendment to the Record of Decision for the Bunker Hill Mining and Metallurgical Complex (Non-Populated Areas) Superfund Site*. USEPA/AMD/R10-96/146. USEPA ID: IDD048340921. September 3, 1996.

USEPA. 1996b. *Explanation of Significant Differences for Revised Remedial Actions at the Bunker Hill Superfund Site, Shoshone County, Idaho.* January 1996.

USEPA. 1992. *Record of Decision, Bunker Hill Mining and Metallurgical Complex* [Non-Populated Area], *Shoshone County, Idaho.* September 1992. (Although not in the title, this ROD addressed the non-populated areas of the site, as well as those aspects of the populated areas that were not addressed in the 1991 OU1 ROD)http://www.epa.gov/superfund/sites/rods/fulltext/r1092041.pdf

USEPA. 1991. *Record of Decision, Bunker Hill Mining and Metallurgical Complex Residential Soils Operable Unit, Shoshone County, Idaho.* August 1991. http://www.epa.gov/superfund/sites/rods/fulltext/r1091028.pdf

# 2 Background

This section provides information on the following:

2.1 Site Location, Description, and Characteristics

2.2 Site History

2.3 Source and Nature of Contamination

2.4 State Superfund Contracts and Cost-Share Agreements

2.5 The Coeur d'Alene Basin Environmental Improvement Project Commission

## 2.1 Site Location, Description, and Characteristics

The Bunker Hill Superfund Site was listed on the National Priority List (NPL) in 1983. This NPL Site has been assigned Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) identification number IDD048340921. The Site includes mining-contaminated areas in the Coeur d'Alene River corridor, adjacent floodplains, downstream water bodies, tributaries, and fill areas, as well as the 21-square mile Bunker Hill "Box" located in the area surrounding the historic smelting operations.

The U.S. Environmental Protection Agency (USEPA) has designated three operable units (OUs) for the Site:

- The populated areas of the Bunker Hill Box (OU1);
- The non-populated areas of the Box (OU2); and
- Mining-related contamination in the broader Coeur d'Alene Basin (the "Basin" or OU3).

Figure 2-1 is a location map of the Bunker Hill Superfund Site. Detailed descriptions of the physical and cultural settings of the Site can be found in the Site Records of Decision (RODs) (USEPA, 1991, 1992 and 2002). The general characteristics of each OU are summarized below.

### 2.1.1 Operable Unit 1

#### 2.1.1.1 Physical Characteristics

Operable Unit 1 is located within the 21-square-mile area surrounding the former smelter complex commonly referred to as the Bunker Hill "Box." The Box is located in a steep mountain valley in Shoshone County, Idaho, east of the city of Coeur d'Alene. Interstate 90 (I-90) bisects the Box and parallels the South Fork of the Coeur d'Alene River (SFCDR).

OU1 is often referred to as the populated areas of the Bunker Hill Box, and is home to more than 7,000 people in the cities of Kellogg, Wardner, Smelterville, and Pinehurst, as well as the unincorporated communities of Page, Ross Ranch, Elizabeth Park, and Montgomery Gulch. The populated areas include residential and commercial properties, street rights-of-way (ROWs), and public use areas. Most of the residential neighborhoods and the former smelter complex are located on the valley floor, side gulches, or adjacent hillside areas. Cleanup activities first began in OU1 as this was the area of greatest concern for human health exposure from mine waste.

#### 2.1.1.2 Land and Resource Use

Current land use in OU1 is primarily residential and commercial properties. Future land use is expected to be similar to current land use.

### 2.1.2 Operable Unit 2

#### 2.1.2.1 Physical Characteristics

Operable Unit 2 includes the non-populated, non-residential areas of the Bunker Hill Box. These non-populated areas include the former industrial complex and Mine Operations Area (MOA) in Kellogg, the Smelterville Flats (the floodplain of the SFCDR in the western half of OU2), hillsides, various creeks and gulches, the Central Impoundment Area (CIA), and the Bunker Hill Mine and associated Acid Mine Drainage (AMD). The SFCDR within OU2 and the non-populated areas of the Pine Creek drainage are both addressed as part of OU3.

#### 2.1.2.2 Land and Resource Use

Current land uses in OU2 are primarily for non-residential, industrial, and open space. Future land uses will also include recreational, residential (single and multi-family), commercial and light industrial.

### 2.1.3 Operable Unit 3

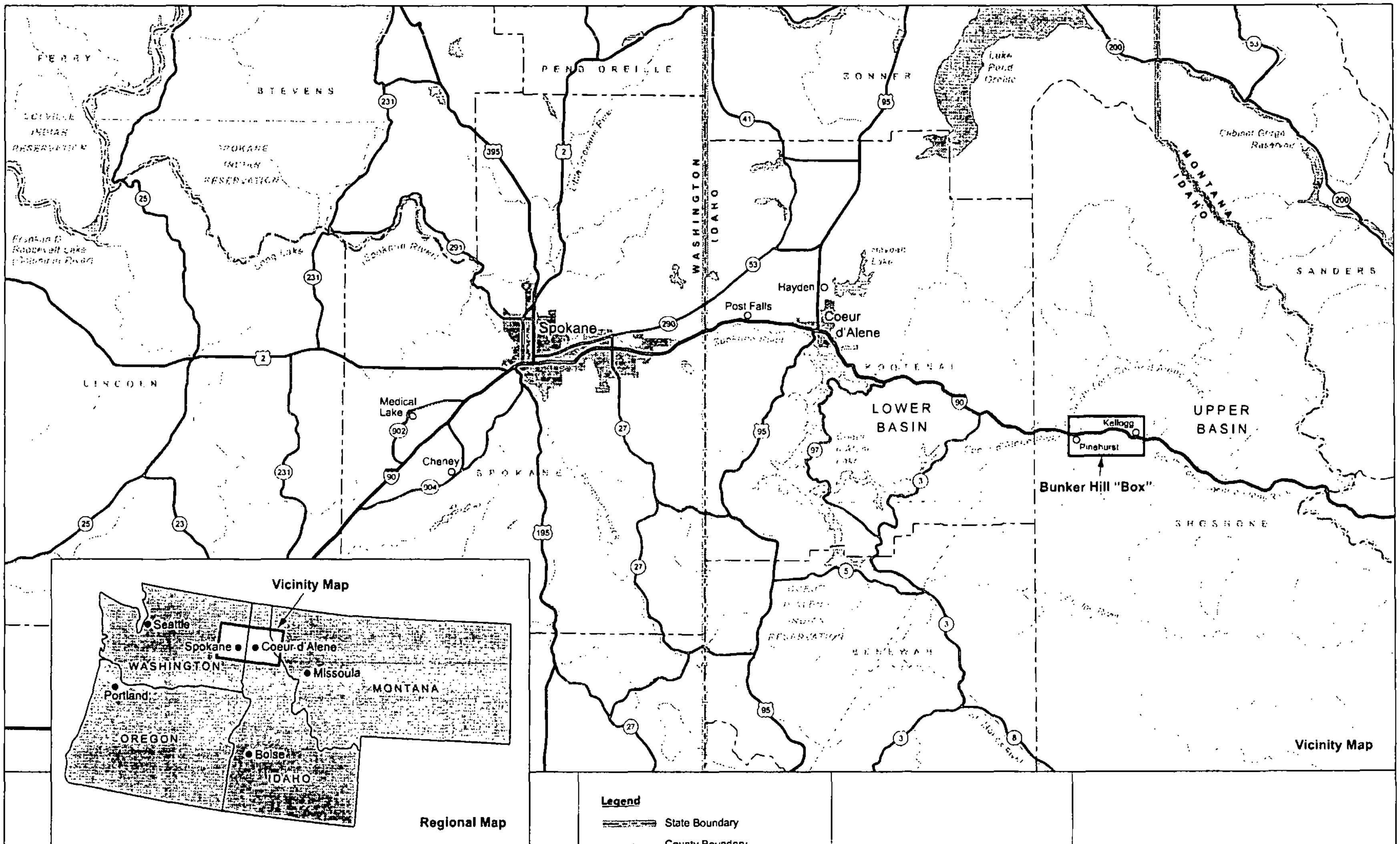
#### 2.1.3.1 Physical Characteristics

Operable Unit 3 consists of the mining-contaminated areas in the Coeur d'Alene Basin outside of OU1 and OU2, primarily the floodplain and river corridor of the Coeur d'Alene River (including Coeur d'Alene Lake) and the Spokane River as well as those areas where mine wastes have come to be located as a result of their use for road building or for fill and construction of residential or commercial properties. Spillage from railroad operations also contributed to contamination across the Basin.

For study purposes, OU3 was divided into four areas: the Upper Basin (i.e., areas east of Cataldo, Idaho, outside OU1 and OU2), the Lower Basin (west of Cataldo to the mouth of Coeur d'Alene River), Coeur d'Alene Lake, and the Spokane River.

#### 2.1.3.2 Land and Resource Use

Current land uses in OU3 are a mix of residential, commercial, agricultural, and open space. Future land use is expected to be similar to current land use.




NOTE: OU3 consists of mining-contaminated areas in the Coeur d'Alene River corridor outside of OU1 and OU2, primarily adjacent floodplains, downstream water bodies, tributaries (including Coeur d'Alene Lake and the Spokane River), and fill areas.

**Legend**

- State Boundary
- County Boundary
- Indian Reservation Boundary
- Interstate Highway
- U.S. Highway
- State Highway

N

0 5 10 15 Miles

FIGURE 2-1

**LOCATION MAP**
**BUNKER HILL SUPERFUND SITE**

FIVE-YEAR REVIEW

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## 2.2 Site History

The Bunker Hill Superfund Site is within one of the largest historical mining districts in the world. Commercial mining for lead, zinc, silver, and other metals began in the Silver Valley in 1883. Heavy metals contamination in soil, sediment, surface water, and groundwater from over 100 years of commercial mining, milling, smelting, and associated modes of transportation has impacted both human health and environmental resources in many areas throughout the Site. Smelter operations ceased in 1981, but limited mining and milling operations continued onsite from 1988 to 1991, and small-scale mining operations continue today.

After listing on the NPL in 1983, remedial investigations (RIs) and feasibility studies (FSs) initially focused on the 21-square-mile Bunker Hill Box (MFG, 1992a and 1992b). The USEPA published the first Site ROD in August 1991 providing the selected remedy for OU1 residential soils (USEPA, 1991). The second ROD for the Site was published by the USEPA in September 1992 addressing contamination in the non-populated OU2, as well those aspects of OU1 that were not addressed in the 1991 OU1 ROD (USEPA, 1992). These two OUs then proceeded into remedial design (RD) and remedial action (RA) phases of work. Since publication of the 1992 OU2 ROD, a number of remedy changes and clarifications have been documented in two OU2 ROD amendments (USEPA 1996a and 2001a) and two Explanations of Significant Difference (ESDs) (USEPA 1996b and 1998).

The USEPA began the Remedial Investigation/Feasibility Study (RI/FS) for OU3 in 1998 (USEPA, 2001b and 2001c) and issued its interim, thirty-year ROD to clean up mining contamination in 2002 (USEPA, 2002). A number of removal actions to address immediate threats and/or obvious sources of contamination in or along streams were completed prior to the OU3 ROD. Remedial design, remedial action, and studies to support future OU3 remedial actions were initiated in 2003.

The first five-year review of the Bunker Hill Superfund Site remedies resulted in two separate five-year review reports: one for OU1 (USEPA, 2000b) and the other for OU2 (USEPA, 2000a). The USEPA published these reports in September 2000, approximately 5 years after initiation of the first remedial action at the Site. This five-year review is the second evaluation of remedy performance of OUs 1 and 2. It also focuses for the first time on the remedies for OU3; however, the large majority of the OU3 remedies have yet to be implemented.

A narrative of the major events that have occurred at each of the OUs is provided below. Table 2-1, located at the end of this section, provides a chronological list of major events that have occurred at the Site from 1883 to 2003. Sections 3, 4, and 5 provide timelines of major events that have occurred at each of the OUs.

### 2.2.1 Operable Unit 1 History

The human health effects associated with exposure to heavy metals have been studied extensively at the Bunker Hill Superfund Site (Landrigan, Baker et al., 1976; ATSDR, 1997a and 1997b; Stokes, Letz et al., 1998; Rao, Henriques et al., 1999). Childhood lead poisoning was epidemic in the 1970s, with greater than 75 percent of children exceeding 40 micrograms per deciliter (μg/dL) blood lead (von Lindern, Spalinger et al., 2003a). As a result, health response activities have been ongoing for three decades.

During 1973-1974, the lead smelter operated without controls following a fire in the main baghouse. Excessive smelter emissions and deposition of fine, high-lead particulate in air, soil, and dusts were the principal exposure routes to children. Dozens of children were diagnosed with clinical lead poisoning and several were hospitalized and chelated. Emergency response actions were initiated in 1974; however, mean blood lead levels in preschool children remained near 40 μg/dL until smelter closure in 1981 (Idaho Department of Health and Welfare, 1976; Ian von Lindern, Spalinger et al., 2003a; Ian H. von Lindern, Spalinger et al., 2003b).

Starting in 1983, a Lead Health Study was jointly conducted by state, federal, and local health agencies to identify blood lead levels and exposure pathways in the community (PHD, 1986). In 1985, a Lead Health Intervention Program (LHIP) was initiated by the State of Idaho with funding provided by the Centers of Disease Control and Prevention (CDC) and the Agency for Toxic Substances and Disease Registry (ATSDR). The LHIP was developed to minimize blood lead levels in children through health education, parental awareness, and biological monitoring. This ongoing program is administered by the Panhandle Health District (PHD) in conjunction with the Idaho Department of Environmental Quality (IDEQ).

In 1986, sixteen public properties (including city parks and school playgrounds) were remediated as part of a Comprehensive Environmental, Response, Compensation and Liability Act (CERCLA) time-critical removal action. In 1989, additional CERCLA time-critical removal actions were implemented to replace contaminated soils in yards of young children at highest risk of lead poisoning.

The OU1 Residential Soils ROD was published in 1991 (USEPA, 1991). Additional remedial actions in the residential areas (e.g., remediation of house dust, commercial properties, and ROWs were identified in the 1992 OU2 ROD for the non-populated areas (USEPA, 1992).

In 1994, the USEPA and the State of Idaho entered into a consent decree (CD) with the Potentially Responsible Parties (PRPs) for remedial work inside the Box.[1] As part of the CD work obligations, the PRPs were required to remediate at least 200 residential yards each year until all contaminated yards, commercial properties, and ROWs have been remediated.

In 1995, the Institutional Controls Program (ICP) was adopted by the PHD to address the Box communities. The ICP is based on a set of rules and regulations designed to ensure the integrity of protective barriers throughout the site.

The first five-year review report for OU1 was published in 2000 (USEPA, 2000b).

In 2002, the USEPA and the State of Idaho assumed responsibility over a portion of the residential property remediation due to the PRPs not fulfilling their CD work obligations.

[1] Consent Decree; Bunker Hill; United States of America and State of Idaho v. ASARCO Incorporated, Coeur d'Alene Mines Corporation, Callahan Mining Corporation, Hecla Mining Company, Sunshine Precious Metals, Sunshine Mining Company; Civil Action No. 94-0206-N-HLR; May 10, 1994.

The USEPA and the State continued this partial "takeover" during the 2002, 2003, and 2004 construction seasons.

### 2.2.2 Operable Unit 2 History

In 1989, the USEPA presented various orders to the PRPs to begin remediation of environmental problems within OU2. A ROD for OU2 was published in 1992 (USEPA, 1992). Two OU2 ROD amendments and two ESDs (January 1996 and April 1998) have been issued (September 1996 and December 2001).

PRP-supported cleanup efforts ensued for about 10 years, including the funding of numerous studies, the initial cleanup of the smelter complex, the terracing of the denuded hillsides, and some revegetation work. However, with the 1991 bankruptcy of one of the Site's PRPs (the Bunker Limited Partnership, or BLP) and the subsequent bankruptcy of the Site's major PRP (Gulf Resources) in 1994, the USEPA and the State of Idaho assumed responsibility for the 1992 OU2 ROD-specific remedial actions that were previously BLP and Gulf responsibilities in 1995. These included remedial actions at the following areas:

- Hillsides;
- Gulches (Grouse, Government, Magnet and Deadwood);
- Smelterville Flats, north and south of I-90;
- Central Impoundment Area (CIA);
- Industrial Complex (Lead Smelter, Zinc Plant, Phosphoric Acid Plant) ;
- Boulevard Area and Railroad Gulch;
- Mine Operations Area (MOA);
- Central Treatment Plant (CTP);
- Bunker Creek; and
- Milo Creek and Reed Landing.

Remaining PRPs signed CDs with the USEPA and committed to implementing the following OU2 remedial actions:

- Page Pond remediation (ASARCO, Hecla, and Sunshine).[2]
- Remediation of the Union Pacific Railroad (UPRR) ROW through OU2; and[3]
- Closure of the A-4 Gypsum Pond (Stauffer Management Company). [4]

In 1995, with the bankruptcy of the Site's major PRP, the USEPA and the State of Idaho defined a path forward for phased remedy implementation in OU2. Phase I of remedy implementation includes extensive source removal and stabilization efforts, all demolition activities, all community development initiatives, development and initiation of an ICP, future land use development support, and public health response actions. Also included in

[2] Consent Decree; Bunker Hill; United States of America and State of Idaho v. ASARCO Incorporated, Coeur d'Alene Mines Corporation, Callahan Mining Corporation, Hecla Mining Company, Sunshine Precious Metals, Sunshine Mining Company; Civil Action No. 94-0206-N-HLR; May 10, 1994.

[3] Consent Decree; Bunker Hill; United States of America and State of Idaho v. Union Pacific Railroad Company; Stauffer Management Company; Rhone-Poulenc; Civil Action No. 95-0152-N-HLR; March 24, 1995.

[4] Consent Decree; Bunker Hill; United States of America and State of Idaho v. Union Pacific Railroad Company; Stauffer Management Company; Rhone-Poulenc; Civil Action No. 95-0152-N-HLR; March 24, 1995.

Phase I are additional investigations to provide the necessary information to resolve long-term water quality issues, including technology assessments and pilot studies, evaluation of the success of source control efforts, development of site-specific water quality and effluent-limiting performance standards, and development of a defined operation and maintenance (O&M) plan and implementation schedule. Interim control and treatment of contaminated water and AMD is also included in Phase I of remedy implementation. Phase I remediation began in 1995, and source control and removal activities are near completion.

Phase II of the OU2 remedy will be implemented following completion of source control and removal activities and evaluation of the impacts of these activities on meeting water quality improvement objectives. Phase II will consider any shortcomings encountered in implementing Phase I and will specifically address long-term water quality and environmental management issues. In addition, the ICP and future development programs will be reevaluated as part of Phase II.

The effectiveness evaluation of the Phase I source control and removal activities to meet the water quality improvement objectives of the 1992 OU2 ROD will be used to determine appropriate Phase II implementation strategies and actions. In addition, although the 1992 OU2 ROD goals did not include protection of ecological receptors, additional actions may be considered within the context of site-wide ecological cleanup goals. Both ROD and State Superfund Contract (SSC) amendments are required prior to implementation of Phase II remedial actions (see Section 2.4 of this report for a discussion of SSCs).

Operable Unit 2 also includes the Bunker Hill Mine and associated AMD. The 1992 OU2 ROD did not select response actions for the mine water and therefore did not address control of AMD from the Bunker Hill Mine or operation of the CTP where the AMD is treated, in any significant way. It also did not identify any plans for the long-term management of the mine water flows or address the long-term management of sludge from the CTP. Additional remedies addressing these AMD issues were selected in the December 2001 OU2 ROD Amendment (USEPA, 2001a).

To date, the USEPA and the State of Idaho have not concluded negotiations on a SSC amendment that allows for full implementation of this ROD amendment. Time-critical components of the 2001 OU2 ROD Amendment were implemented, however, to avoid potential catastrophic failure of the aging CTP and to provide for emergency mine water storage (USEPA and IDEQ, 2003d). These time-critical activities focused on preventing discharges of AMD to Bunker Creek and the SFCDR. Until an SSC amendment is signed allowing for full implementation of the 2001 OU2 ROD Amendment, control and treatment of AMD and its impact on water quality will continue to be an issue. The USEPA and the State of Idaho continue to discuss the SSC amendment, and the long-term obligations associated with the full mine water remedy.

The first five-year review report for OU2, published in September 2000, summarized both PRP- and government-led activities (USEPA, 2000a).

### 2.2.3 Operable Unit 3 History

Prior to the OU1 and OU2 RODs, it was recognized that mining-related contamination in the Coeur d'Alene Basin was not limited to the areas within OU1 and OU2. Starting in 1989, removal actions were initiated in OU3 to address immediate threats and/or obvious sources of contamination in or along streams.

The first comprehensive study of human health effects outside of OU1 and OU2 was conducted in 1996 by the IDHW, the PHD, and the ATSDR (IDHW, 2000). The study indicated excessive levels of lead absorption by children.

In September 1996, the United States District Court for the Western District of Washington ordered the USEPA and the State of Idaho to develop a schedule for completion of total maximum daily loads (TMDLs) for all water-quality impaired streams identified by the state, including the Coeur d'Alene River Basin. In August 2000, a TMDL for dissolved cadmium, lead, and zinc in surface waters of the Basin was jointly issued by the USEPA and the State of Idaho (USEPA and IDEQ, 2000).[5] The TMDL established waste load allocations for discrete point sources and load allocations for non-discrete sources. It has long been recognized that non-discrete sources are the primary sources of metals in surface water in the Coeur d'Alene Basin. The CERCLA remedial process was identified as the most effective tool to address these non-discrete sources.

Because of the presence of environmental and human health impacts in areas outside of OU1 and OU2 and the limitations of the existing authorities to deal with these impacts, the USEPA initiated a RI/FS for the Coeur d'Alene Basin in 1998. The final RI/FS (USEPA, 2001b and 2001c), Ecological Risk Assessment (USEPA, 2001d), and Human Health Risk Assessment (IDHW, 2001) were released in 2001.

On September 12, 2002, the USEPA issued an interim ROD to address mining contamination in OU3 (USEPA, 2002). The cleanup plan resulted from several years of intensive studies to determine the extent of contamination and the associated risks to people and the environment. The 2002 OU3 interim ROD (hereafter "2002 OU3 ROD") describes the specific cleanup work, called the interim Selected Remedy (hereafter "the remedy") that will occur in the Basin at a cost of about $360 million over approximately the next thirty (30) years. The following governments and agencies in the areas targeted for cleanup gave their support for conducting the cleanup selected in the 2002 OU3 ROD: the State of Idaho, the Coeur d'Alene Tribe, the Spokane Tribe, the State of Washington, the U.S. Bureau of Land Management (BLM), the U.S. Fish and Wildlife Service (USFWS), and the U.S. Forest Service (USFS).

The 2002 OU3 ROD represents a significant step toward meeting the goal of full protection of human health and the environment in the Basin. The cleanup plan includes:

- The full remedy needed to protect human health in the community and residential areas, including identified recreational areas of the Upper Basin and Lower Basin, as well as Washington recreational areas along the Spokane River upstream of Upriver Dam; and
- An interim remedy of prioritized actions for protection of the environment that focus on improving water quality, minimizing downstream migration of metal contaminants, and improving conditions for fish and wildlife populations.

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[5] On September 4, 2001, a district court judge for the State of Idaho invalidated the TMDL on the procedural grounds that the State of Idaho had not engaged in formal rulemaking when adopting the Basin TMDL. The invalidation of the TMDL was appealed to the Idaho Supreme Court and the decision was upheld. Any new Basin TMDL developed by the State of Idaho would be required to go through a formal rulemaking under State law before being sent to the USEPA for approval.

Certain potential exposures to human health outside of the communities and residential areas of the Upper Basin and Lower Basin were not addressed by the 2002 OU3 ROD. These potential exposures impacting human health include:

- Recreational use at areas in the Upper Basin and Lower Basin where cleanup actions are not implemented pursuant to the 2002 OU3 ROD;
- Subsistence lifestyles, such as those traditional to the Coeur d'Alene and Spokane Tribes; and
- Potential future use of groundwater that is currently contaminated with metals.

In addition, a remedy for Coeur d'Alene Lake is not included in the 2002 OU3 ROD. State, tribal, federal, and local governments are in the process of developing a revised lake management plan outside of the Superfund process using separate regulatory authorities. The OU3 ROD does state, however, that the USEPA will evaluate lake conditions in future five-year reviews.

The USEPA's first priority for implementation of the 2002 OU3 ROD is to remediate residential and recreational areas that pose direct human health risks. Subsequent actions will include cleanup of areas that pose ecological risks. EPA Region 10 has received funding for implementation of the OU3 human health remedy. The Region will continue to work with EPA Headquarters and other parties to secure funding for full implementation of the 2002 OU3 ROD.

Idaho state legislation under the Basin Environmental Improvement Act (Title 39, Chapter 810) established the Coeur d'Alene Basin Environmental Improvement Project Commission (Basin Commission). This commission includes federal, state, tribal, and local governmental involvement. The USEPA serves as the federal government representative to the Basin Commission and will continue to work closely with the governments and communities as they implement the cleanup plan. The USEPA will continue to be responsible for ensuring that the cleanup work meets the requirements of the 2002 OU3 ROD as well as CERCLA laws and regulations.

The National Academies' National Research Council (NRC) is conducting an independent evaluation of the Coeur d'Alene Basin to examine the USEPA's scientific and technical practices in Superfund site characterization, human and ecological risk assessment, remedial planning, and decision-making. The NRC is an independent, nongovernmental institution that advises the nation on scientific, technical, and medical issues. The Idaho Congressional delegation requested that the study be performed, and Congress mandated that the USEPA fund the study at a cost of $850,000. The NRC convened the Committee on Superfund Site Assessment and Remediation in the Coeur d'Alene Basin, composed of members with a wide range of expertise and backgrounds.

The NRC study began in June 2003. During the study, the NRC held public sessions in Washington, D.C.; Wallace, Idaho; and Spokane, Washington. On July 14, 2005, the NRC released a pre-publication version of its report (see www.nas.edu, search on "coeur") (NRC, 2005). The pre-publication report reflects unanimous consensus of the Committee and has undergone a rigorous peer review process. On July 15, 2005, the NRC hosted a public meeting at the North Idaho College in Coeur d'Alene to share the report findings and answer questions from the public. The final NRC report will be published in book form in December 2005.

The USEPA is conducting a careful review of the NRC pre-publication report recommendations and findings. The USEPA, along with others invested in the issues, are considering the NRC report's recommendations and, where appropriate, will translate those findings into action. Region 10 remains committed to work closely with the Basin Commission, as well as the Commission's Technical Leadership Group (TLG) and Citizens' Coordinating Council (CCC).

# 2.3 Source and Nature of Contamination

## 2.3.1 Source of Contamination

Metals related to mining, milling, and smelting activities are present in the following media throughout the Site: soil, sediment, surface water, and groundwater. The most significant contaminants are antimony, arsenic, cadmium, copper, lead, mercury, and zinc. The principal sources of metal contamination were tailings generated from the milling of ore and discharged to the SFCDR and its tributaries or confined in large waste piles on site, waste rock, and air emissions from OU2 smelter operations. Spillage from railroads and other modes of transportation also contributed to contamination across the Site.

In the RI conducted in OU2 (MFG, 1992b), typical lead concentrations found in wastes and soils within the OU2 smelter complex ranged to 100,000 milligrams per kilogram (mg/kg) or more. Tailings in the river's flood plain averaged greater than 20,000 mg/kg lead. Soils in residential yards in the smelter communities averaged 2,500 mg/kg to 5,000 mg/kg in the early 1980s, and house dust lead concentrations averaged 2,000 mg/kg to 4,000 mg/kg at that time. For additional quantitative data on levels of contamination found during the RI, see the Ecological and Human Health Risk Assessments referenced in Section 2.2.3.

Tailings were also transported downstream, particularly during high flow events, and deposited as lenses of tailings or as tailings/sediment mixtures in the bed, banks, floodplains, and lateral lakes of the Coeur d'Alene River Basin and in Coeur d'Alene Lake. Some fine-grained material washed through the lake and was deposited as sediment within the Spokane River flood channel. The estimated total mass and extent of impacted materials (primarily sediments) exceeds 100 million tons dispersed over thousands of acres (USEPA, 2001c).

Section 2.3.2 describes the nature and extent of contamination in the three OUs. For additional quantitative data on levels of contamination found during the remedial investigations, see the applicable OU RODs.

## 2.3.2 Nature and Extent of Contamination

### 2.3.2.1 Contamination Affecting Primarily Human Health

The primary media of concern for human health in all three OUs are:

- Contaminated soil where it occurs in residential yards, ROWS, commercial and undeveloped properties, common areas, and airborne dust generated at these locations;

- Contaminated house dust, originating primarily from contaminated soil. (The OU3 ROD also identified interior house paint as a potential source of lead.);
- Drinking water from local wells or surface water;
- Contaminated aquatic food sources (e.g., fish);
- Contaminated homegrown vegetables; and
- Contaminated floodplain soil, sediments, and vegetation.

People can be exposed to chemicals of concern (COCs) by ingesting soil, breathing dust, drinking water, and eating contaminated fish or homegrown vegetables. The COCs for protection of human health are:

- Lead and arsenic in soil and sediment;
- Lead in house dust; and
- Arsenic, lead, and cadmium in drinking water from unregulated sources.

Although fish and vegetables were not screened for COCs, indicator metals were selected for these based on toxicity and presence in the Basin. The selected indicator metals for fish consumption were cadmium, lead, and mercury; and for vegetable consumption were arsenic, cadmium, and lead.

Exposures to lead in soil and dust from the home and surrounding communities are the primary human health concerns. Exposure to contaminated soil and sediment at recreational areas also are a concern. Drinking water obtained from private, unregulated sources is another potential exposure route.

#### 2.3.2.2 Contamination Affecting Primarily Ecological Receptors

Contaminated media that potentially affect ecological receptors are surface water, soil, and sediment. In addition, groundwater is important as a pathway for migration of metals to surface water. The chemicals of ecological concern for ecological protection are:

- Cadmium, copper, lead, and zinc in surface water;
- Arsenic, cadmium, copper, lead, and zinc in soil; and
- Arsenic, cadmium, copper, lead, mercury, silver, and zinc in sediment.

Cadmium, lead, and zinc are pervasive in all environmental media and generally present higher risks to ecological receptors than arsenic, copper, mercury, and silver.

The following sections describe the nature and extent of contamination for both human health and ecological receptors for specific areas of the Site.

##### *The Box (Operable Units 1 and 2)*

The main source of contamination in the Box includes jig tailings, flotation tailings, inflow of contaminants from upstream sources, air emissions from ore processing facilities, particulate dispersion from ore stockpiles, and residuals from the industrial complex. Spillage from railroads and other modes of transportation also contributed to contamination across the Site. Additional sources included gypsum generated from phosphoric acid production and zinc fuming, and AMD emanating from the Bunker Hill Mine.

The Site's first mill for processing lead and silver ore was constructed in 1886 and had a capacity of 100 tons of raw ore per day. Subsequent mills built at the Site contributed to a total of 2,500 tons of processed ore per day (USEPA, 1992). Jig and flotation tailings were generated as waste products during concentration of mined ores. Jig tailings were generated by earlier mine concentrating techniques and were typically dumped on the valley floor. During flood events, these tailings were transported by the SFCDR, mixed with alluvium, and deposited on the flood plain. Over time, the valley floor throughout and downstream of OU2 became mantled with a mixture of jig tailings, flotation tailings, and alluvium as floods occurred and as the SFCDR naturally meandered across the valley floor.

Flotation tailings, which were generated by an improvement to ore concentration methods that came into predominant use in 1930, were typically discharged to the CIA and Page Ponds tailings impoundments. The flotation tailings were identified during the RI/FS as an important source of air-borne contamination as well as a source of contamination to groundwater and surface water.

Air emissions occurred from ore processing facilities. Although both the lead smelter and zinc plant in Kellogg had recycling processes designed to minimize air-borne particulates, significant metals deposition still occurred together with deposition of sulfur dioxide emissions. In the 1960s, lead emissions from the two lead smelter stacks averaged from 10 to 15 tons per month. After a September 1973 fire in the baghouse of the main stack, particulate emissions containing 50 to 70 percent lead increased to about 25 tons to over 140 tons per month (USEPA, 1986). Emissions affected areas near the smelter and zinc plant as well as the surrounding hillsides.

Materials and residues from the smelter complex included ores, concentrates, sinter and calcine, copper dross flue dust, lead residues, slag, gypsum, and other materials and wastes. These materials were stored, transported, and occasionally spilled in various areas around the Box. Gypsum was generated during production of phosphoric acid, and slag was produced by fuming processes aimed at converting zinc sulfide to zinc oxide. For the most part, these materials were either concentrated in ponds or deposited in the CIA. AMD from the Bunker Hill Mine was impounded at the CIA without treatment until 1974, after which the CTP was constructed and put on-line. From 1974 until 1996, AMD continued to be pumped to an unlined holding pond on top of the CIA prior to treatment.

### *Upper Coeur d'Alene Basin Outside the Box (OU3)*

The Upper Basin encompasses the steep mountain canyons of the SFCDR and its tributaries. OU3 encompasses those Upper Basin areas outside of the Box.

The Upper Coeur d'Alene Basin contains many primary sources for mining-related hazardous substances (metals) including mine workings, waste rock and other mining waste, mine tailings, concentrates and other process wastes, artificial fill (tailings and waste rock in roads, railroads, and building foundations), and other locations. Based on mapping conducted by the BLM (BLM, 1999), approximately 2,850 acres of land have been disturbed by mining-related activities or deposition of mining-related wastes in the Upper Basin (not including areas within OU1 and OU2). Approximately 295 acres of disturbed area were identified by the BLM as riparian. Approximately 1,200 acres of other impacted floodplain areas were identified by the BLM. As a consequence of the historic mining operations, heavy metals contamination is present in soils, sediment, surface water and ground water.

As discussed more fully in the OU3 RI, the Upper Basin is a primary source of dissolved metals in the river system (USEPA, 2001c). Based on the estimated historic average values, about 1,550 pounds per day of dissolved zinc (53 percent of the total Upper Basin load) came from sources inside OU1 and OU2 and about 1,370 pounds per day of dissolved zinc (47 percent of the total Upper Basin load) came from sources in the Upper Basin outside of OU1 and OU2. Impacted sediments and associated groundwater in the valley fill aquifers of the Upper Basin are the largest sources of dissolved metals loading in the river and streams. An estimated 71 percent of the load is derived from impacted sediments and associated groundwater. Surface water and groundwater percolates through the tailings-impacted sediments and dissolves metals. The water discharges into the streams and rivers, carrying the dissolved metal load with it. Metal loading is enhanced by the relatively large degree of surface water/groundwater interaction that occurs in some parts of the Upper Basin. In areas where the valley floor widens, streams lose water to the valley fill aquifer. In areas where the valley floor constricts, ground water discharges back into the streams, carrying additional metals load.

An estimated 7 million cubic yards (cy) of tailings-impacted sediments are present in the Upper Basin, including an estimated 3 million cy of sediments that potentially cannot be accessed for excavation because they are beneath the I-90 embankment, other roads, or residential or commercial structures. In addition to the estimated 7 million cy of sediments, analysis of deeper sediments samples indicates metals concentrations generally exceed background concentrations to depths of 10 to 30 feet. These deeper sediments are potentially an important secondary source of metals. Relatively little of the dissolved metals in the river system comes from discrete sources. Discrete sources include National Pollutant Discharge Elimination System (NPDES) permitted discharges, and unpermitted discrete discharges (adit and seep discharges). The estimated loads from the discrete discharges account for only about 8 percent of the estimated dissolved zinc load in the SFCDR at Pinehurst located at the western end of OU2.

### *Lower Coeur d'Alene Basin (OU3)*

The Lower Basin includes the main stem Coeur d'Alene River, the lateral lakes area, and extensive floodplain wetlands. Below Cataldo, the river flows into a broad, flat valley and takes on a meandering, depositional valley and takes on a meandering, depositional character with a fine sediment bottom. From Rose Lake downstream, the river surface elevation is controlled by Post Falls Dam on the Spokane River near the outlet from the Coeur d'Alene Lake. Much of the tailings released to streams in the Upper Basin were transported to and deposited within the river channel and floodplains in the Lower Basin, largely transported during flood events.

In the Lower Basin, erosion of river banks and beds is a major secondary source of metals, particularly lead, entering the Coeur d'Alene River. There are an estimated 1.8 million cy of impacted bank materials and an estimated 20.6 million cy of impacted bed sediments subject to erosion. The average concentration of lead in over 2,000 non-random sediment samples within the floodplain collected in the Lower Basin is 3,100 mg/kg (USEPA, 2001c).

The increase in total lead load below the confluence of the North Fork of the Coeur d'Alene River (NFCDR) and the SFCDR is about 1,040 pounds per day, or about 69 percent of the load that discharges to the lake. Lead tends to bind more strongly to soil particles than does zinc, and the lead load is largely due to erosion of soil and sediment, particularly during high-flow periods. As a result, the total lead loads display a large variability with time. During the 100-year flood event in February 1996, an estimated 1,400,000 pounds of lead were discharged to Coeur d'Alene Lake in a single day. Lower Basin wetlands, 100-year floodplains, and lateral lake sediments are the major sources of metals ingested by waterfowl and other animals. Based on geostatistical analysis, there are about 18,300 acres of floodplain sediments that contain more than 530 mg/kg of lead in the surficial sediments, the lowest observed adverse effects level (LOAEL) for waterfowl. The area containing more than 530 mg/kg of lead represents an estimated 95 percent of the 19,200 acres of floodplain habitat present in the Lower Basin. There are about 15,400 acres of floodplain sediments that contain more than 1,800 mg/kg of lead, the mortality threshold concentration for waterfowl. The area containing more than 1,800 mg/kg of lead represents an estimated 80 percent of the 19,200 acres of floodplain habitat present in the Lower Basin.

The Lower Basin includes the Cataldo/Mission Flats area, where tailings were dredged from the river and placed within the 100-year floodplain from 1932 to 1967. An estimated 13 million cubic yard of tailings-impacted dredge spoils cover about 680 acres at this location.

### *Coeur d'Alene Lake (OU3)*

Coeur d'Alene Lake is a natural lake, but Post Falls Dam controls its elevation. Coeur d'Alene Lake encompasses 49.8 square miles at its normal full-pool elevation (2,128 feet above sea level), with a maximum water depth of 209 feet. The 2,128 feet elevation is the level defined by Avista's Federal Energy Regulatory Commission (FERC) license as the maximum permitted lake level. The lake has a drainage area of 3,741 square miles. Its principal tributaries are the St. Joe and Coeur d'Alene Rivers. The discharge from the lake forms the Spokane River. Coeur d'Alene Lake is the homeland of the Coeur d'Alene Tribe.

The beaches and wading areas adjacent to Coeur d'Alene Lake were sampled in 1998 and were found to be safe, i.e., concentrations of metals did not exceed risk-based levels for recreation (USEPA, 2002). The only exceptions are Harrison Beach, which was remediated as part of the UPRR ROW removal action, and Blackwell Island near the mouth of the Spokane River which only exceeded background values for arsenic. No mining contamination has been found in the residential and commercial areas in the cities of Coeur d'Alene, Post Falls, and Harrison.

The water in Coeur d'Alene Lake meets the safe drinking water standards for metals, except when discharge from the Coeur d'Alene River is high (e.g., during high spring runoff or during flood events), which causes short-term lead concentrations that exceed the drinking water standard. The water in the lake exceeds the water quality standards for protection of aquatic life for cadmium and zinc and intermittently for lead.

A fish consumption study was conducted in 2002 in Coeur d'Alene Lake which is also addressed in Section 5.5.1.10 of this report. Based upon this evaluation, Idaho and the Coeur d'Alene Tribe jointly issued a fish consumption advisory in June 2003. The advisory was issued because study results detected lead, mercury, and arsenic at levels that may affect some people's health if they eat more fish than recommended. The advisory also noted that by following the consumption limits in the advisory, the public can continue to enjoy the health benefits from a diet that includes fish caught from Coeur d'Alene Lake. The advisory is posted at boat launches and other locations on Coeur d'Alene Lake. Information about the specifics of the fish advisory is available on the IDHW web page (www.healthandwelfare.idaho.gov).

A large volume of metals-impacted sediment has been deposited in Coeur d'Alene Lake. There are an estimated 44 to 50 million cy of contaminated sediments at the bottom of the lake (USEPA, 2001c). Studies by the United States Geological Survey (USGS) suggest that, under current lake conditions, there is some movement of the metals from the sediment into the water column; however, concurrent releases of dissolved iron facilitate formation of iron-metal complexes in the lake's lower water column. The rate of release of metals in the sediments into the water column could increase if nutrient enrichment causes decreases in near-bottom dissolved-oxygen and pH as a consequence of enhanced biological activity. The lake's geochemical and biological responses to future remediation activities will be influenced by reductions in zinc's suppressive effects on biological productivity. Concomitant reductions in nutrient inputs, particularly phosphorus, may be needed to counteract reductions in zinc concentrations. Limnological data collection and modeling are underway to provide lake managers with knowledge of the interaction of metal contamination and nutrient enrichment in the lake.

### *Spokane River (OU3)*

The Spokane River flows from Coeur d'Alene Lake and is dammed at six locations above its terminus at Lake Roosevelt. The riverbed primarily consists of coarse gravel and cobbles, and the floodplain and riparian areas are relatively narrow. Metals contamination is present in depositional areas within the river's floodway and behind the Upriver Dam.

The beaches and wading areas adjacent to the Idaho portion of the Spokane River were sampled in 1998 and were found to be safe for human health, i.e., concentrations of metals did not exceed risk-based levels for recreation. Sediment depositional areas in the State of Washington portion of the Spokane River were sampled in 1998, 1999, 2000, and 2004. Several depositional areas were found to contain lead at concentrations exceeding the risk-based levels. The water in the Spokane River meets the safe drinking water standards for metals.

In the Spokane River sediment samples, 82 percent of the samples contained lead above the upper background concentration. The average concentration of lead in 265 sediment samples collected in the Spokane River floodway between Coeur d'Alene Lake and Long Lake was 400 mg/kg. The sediment lead cleanup level for the Washington recreational areas along the Spokane River is 700 mg/kg for recreational use (USEPA, 2002). The sediment arsenic cleanup level as selected by the USEPA is 20 mg/kg for recreational use.

Because there are relatively few depositional areas along the Spokane River, the volume of contaminated sediments is small compared to the Upper Basin and Lower Basin. An estimated volume of 260,000 cy of contaminated sediments are present upstream of Upriver Dam.

Additional contaminated sediments are present downstream of Upriver Dam, but have not been quantified. Surface water in the Spokane River has been impacted by metals including particulate lead transported into the Spokane River, particularly during winter storm events and spring runoff.

## 2.4 State Superfund Contracts and Cost-Share Agreements

A State Superfund Contract (SSC) is required prior to initiation of a Federal-lead response action at a Superfund site. [6] The purpose of the SSC is two-fold: First, it obtains the necessary CERCLA assurances from the State such as cost-sharing and O&M responsibilities. Second, it documents the responsibilities of the USEPA and the State during remedial action and includes clauses that outline the basic purpose, scope, and administration of the SSC, as well as the remedial actions to be conducted under the SSC.

In addition to the SSC, a State may be required to enter into a cost-share support agency cooperative agreement (SACA) with the USEPA if it intends to meet any or all of its response action cost-share obligations via in-kind services. [7] The cost-share SACA identifies the approvable categories of activities the State will perform with in-kind services, and in the case of the Bunker Hill Superfund Site, with non-federal funds (credits) to meets its cost-share obligations.

### 2.4.1 The Box SSC and SACA

In 1995, with the bankruptcy of the Site's major PRP, the USEPA and the State of Idaho entered into a SSC specific to OU2 remedial actions (USEPA and IDHW, 1995). This SSC incorporated several additional documents that provided a framework for decision-making and conducting OU2 remedial actions. These documents included:

- Cost-share SACA: Documents the types of activities the State of Idaho will perform with in-kind services and non-federal funds (credits) to satisfy its cost-share obligations for OU2. The State's cost-share is 10 percent of the Federally-financed response action expenditures.[8]
- Memorandum of Agreement: Defines the working relationship between the State of Idaho and the USEPA for the OU2 (and later OU1) cleanups.
- Remedial Action Master Plan (RAMP): Outlines the process by which an individual response action can be selected, refined, designed and constructed.
- Comprehensive Cleanup Plan (CCP) and Two-Phase Strategy: Outlines the conceptual two-phased approach to implement the remedy in OU2.
- Cost Memo: Summarizes the 1995 cleanup cost estimate that was developed by the USEPA and the State of Idaho based on the implementation approaches summarized in the Comprehensive Cleanup Plan.

[6] CERCLA Section 104(a)(1), (c)(2), and (c)(3) and Section 121; 40 CFR 300.515(a) & 300.180(d), and 40 CFR 35.6800(a) & 35.6805(a)

[7] 40 CFR S§§ 31.24 and 35.6815

[8] 40 CFR Parts 35.6105(b)(2), 35.6120(2) & 35.6805(i)(5), and 40 CFR 300.510(b), and Section 104(c)(3) of CERCLA, as amended

#### 2.4.1.1 Amendments

In 2001, the PRPs responsible for OU1 remedial actions indicated they would not fully comply with their CD obligations.[9] In June 2002, the USEPA and the State of Idaho amended the OU2 SSC and cost-share SACA to include the scope and costs associated with a partial USEPA takeover of OU1 residential and common-use area response actions (USEPA and IDEQ, 2002). While negotiations with the PRPs continued, the SSC was again amended in 2003 and 2004 to ensure that priority actions to protect human health continued in OU1 (USEPA and IDEQ, 2003c and 2004). This combined OU1 and OU2 SSC is referred to as the Box SSC.

In December 2001, a comprehensive remedy for AMD was approved in an OU2 ROD Amendment (USEPA, 2001a). To date, the USEPA and the State of Idaho have not concluded negotiations on a SSC amendment that allows for full implementation of this ROD amendment. In March 2003, however, the Box SSC was amended to allow implementation of time-critical components of the 2001 OU2 ROD Amendment to avoid potential catastrophic failure of the aging CTP and to provide for emergency mine water storage (USEPA and IDEQ, 2003d). These time-critical activities focused on preventing discharges of AMD to Bunker Creek and the SFCDR. Until an SSC amendment is signed allowing for full implementation of the 2001 OU2 ROD Amendment, control and treatment of AMD and its impact on water quality will continue to be an issue. The USEPA and the State of Idaho continue to discuss the SSC amendment and the long-term obligations associated with the full mine water remedy.

The Box SSC was again amended in September 2003 to revise and clarify the CERCLA assurance language regarding real property acquisition (USEPA and IDEQ, 2003a). Specifically, the language was revised to reflect disposition of the approximately 1,900 acres the USEPA acquired in 1995 as part of the Gulf bankruptcy settlement. According to the terms of the 1995 SSC, the State will eventually accept transfer of all 1,900 acres. To date, 1,799 acres have already been conveyed to the State for future beneficial use by the communities of the Silver Valley.

### 2.4.2 The Basin SSC and Cost-Share Agreement

In August 2003, the USEPA and the State of Idaho signed a separate SSC and cost-share SACA regarding response activities to be conducted in OU3 (USEPA and IDEQ, 2003b) in accordance with the 2002 OU3 ROD. This SSC includes language regarding the role of the Basin Commission in overseeing the implementation of the 2002 OU3 ROD. The Basin Commission will prepare and approve annual and five-year work plans. The USEPA and the State of Idaho will utilize these work plans to generate an annual list of projects to be performed. The annual project listings are incorporated by reference into the Basin SSC.

## 2.5 Basin Environmental Improvement Project Commission

The Basin Commission was created by the Idaho legislature under the Basin Environmental Improvement Act of 2001 (Idaho Code Title 39, Chapter 81). The Basin Commission

[9] Consent Decree; Bunker Hill; United States of America and State of Idaho v. ASARCO Incorporated, Coeur d'Alene Mines Corporation, Callahan Mining Corporation, Hecla Mining Company, Sunshine Precious Metals, Sunshine Mining Company; Civil Action No. 94-0206-N-HLR; May 10, 1994.

conducts its work in the Coeur d'Alene Basin of Idaho, which is defined as the watershed of Coeur d'Alene Lake within the counties of Shoshone, Kootenai, and Benewah as well as the Coeur d'Alene Reservation located within the state of Idaho (Basin Commission, 2004).

The Basin Commission became operational in March of 2002 and includes one representative each from the State of Idaho, the Coeur d'Alene Tribe, and Shoshone, Benewah, and Kootenai Counties. The State of Washington and the Federal Government joined the Basin Commission through the execution of a Memorandum of Agreement (MOA) signed by the USEPA Administrator in Coeur d'Alene (Basin Commission, 2002). Each of the representatives noted above are signatories to the MOA. In addition, the USFS, the U.S. Department of Interior (USDOI), and the Spokane Tribe signed on to the MOA in the same period. The MOA affirmed the dual roles of the Basin Commission to exercise certain State authorities to address heavy metal contamination in Idaho's Coeur d'Alene Basin as set forth in the enabling legislation, and to oversee and coordinate the implementation of the 2002 OU3 ROD in coordination with other authorities and entities involved in OU3 cleanup activities. In addition, per the MOA, the Basin Commission may address:

- Implementation of Phase II of the OU2 CCP consistent with the 1992 OU2 ROD;
- Adoption and implementation/coordination of the Coeur d'Alene Lake Management Plan (LMP) to manage, enhance, preserve, and protect lake water quality; and
- Remediation of heavy metal contamination at specific mining sites in the NFCDR.

The Basin Commission created the TLG and the CCC to advise the Commissioners on planning and implementation of remedial actions and environmental projects. The TLG "advises and provides recommendations on and plans for all duties related to implementation of Records of Decision and other technical or regulatory issues put forward to the Commission" (Basin Commission, 2002). The TLG consists of federal, state, local and tribal representatives serving the governmental entities with regulatory or land management responsibilities in the Basin that may be affected by remedial actions. The CCC is intended to serve as "the primary information conduit to and from the Basin Commission on citizen/community issues, concerns, and opportunities for input related to Commission activities" (Basin Commission, 2002).

Additional information about the Basin Commission can be found on the Commission's web site: www.basincommission.com.

**Table 2-1. Summary of Major Events at the Bunker Hill Superfund Site from 1883 - 2003**

| Event | Date |
|---|---|
| Mining operations begin at Bunker Hill | 1883 |
| First ore mill constructed | 1886 |
| Lead smelter begins operation in Kellogg (OU2) | 1917 |
| Zinc plant begins operation (OU2) | 1928 |
| Central Impoundment Area (CIA) is created (OU2) | 1928 |
| Gulf purchases Bunker Hill Company (OU2) | 1968 |
| Smelter baghouse fire destroys major air emission control equipment, lead emissions increase dramatically (OU2) | 1973 |
| Central Treatment Plant (CTP) constructed primarily to treat acid mine drainage (AMD) (OU2) | 1974 |
| CDC emergency response to epidemic lead poisoning, including a lead health study conducted by CDC and Idaho Department of Health and Welfare (OU1) | 1974-1975 |
| Residents file suit against Bunker Hill Company for lead poisoning and related injuries. | 1977 |
| Smelting activities end (OU2) | 1981 |
| Bunker Limited Partnership (BLP) purchases the Bunker Hill mine, mill, and smelter (OU2) | 1982 |
| Bunker Hill Site listed on the National Priority List (NPL); the USEPA begins site studies and identifies liable parties. (OU1 and 2) | 1983 |
| Kellogg revisits Childhood Blood Lead and Environmental Survey (OU1) | 1983 |
| Blood lead screening and intervention funded by CDC (OU1) | 1985 -1989 |
| Removal actions: common use areas (OU1) | 1986 |
| Idaho settles natural resource damages (NRD) claim against mining companies | 1986 |
| Blood lead screening and intervention funded by ATSDR (OU1) | 1989-2001 |
| Bunker Hill Mining Company reopens Bunker Hill Mine. Attempts to raise capital for expansion of Mine. | 1989 |
| Removal actions: residential yards start (OU1) | 1989 |
| Administrative Order on Consent with Gulf Resources and Hecla Mining Company for Hillsides Revegetation/Stabilization Removal Action, hillsides planting begins (OU2) | 1990 |
| Bunker Hill Mining Company files for Chapter 11 bankruptcy. The USEPA subsequently resolves its claims against this company as part of bankruptcy proceedings. | 1991 |
| Large-scale mining operations end; small-scale operations still continue today | 1991 |
| Coeur d'Alene Tribe files a Natural Resource Damages (NRD) lawsuit against mining companies | 1991 |
| Initial Potentially Responsible Party (PRP) investigations and cleanups conducted (OU1 and 2) | 1982-1994 |
| Remedial Investigation/Feasibility Study (RI/FS) for OU1 completed | 1991 |
| Record of Decision (ROD) for populated areas (OU1) signed | 1991 |
| BLP files for bankruptcy. The USEPA subsequently resolves its claims against this company as part of bankruptcy proceedings. | 1992 |

**Table 2-1. Summary of Major Events at the Bunker Hill Superfund Site from 1883 - 2003**

| Event | Date |
|---|---|
| The USEPA and the State of Idaho assume remediation and operation and maintenance (O&M) responsibilities (OU2) | 1992 and 1994 |
| RI/FS for OU2 completed | 1992 |
| ROD for non-populated areas (OU2) signed | 1992 |
| Remedial design (RD) for OU1 and OU2 begins | 1993-1994 |
| Gulf Resources file for Chapter 11 bankruptcy. The USEPA subsequently resolves its claims against this company as part of bankruptcy proceedings. | 1994 |
| The USEPA and the State of Idaho enter into a Consent Decree with the Upstream Mining Group for remedial work inside the Bunker Hill Box. | 1994 |
| Consent Decree with the Stauffer Management Company and the Union Pacific Railroad (UPRR) to being work on the A-4 Gypsum Pond and the UPRR ROW in OU2,, respectively | 1995 |
| Institutional Control Program (ICP) adopted for the Box communities | 1995 |
| First State Superfund Contract (SSC) for the Box OU2 | 1995 |
| PRP Residential Remedial Action begins (OU1) | 1995 |
| Phase I Remedial Action construction begins (OU2) | 1995 |
| Basin exposure study conducted (OU3) | 1996 |
| Department of Justice, on behalf of the USEPA, U.S. Department of Agriculture, and Department of Interior, files complaint against Asarco, Hecla, Sunshine Mining Company, and Coeur d'Alene Mines Corporation. This case is consolidated with a pending claim by the Coeur d'Alene Tribe. | 1996 |
| Explanation of Significant Differences (ESDs) for non-populated areas (OU2) issued | 1996 and 1998 |
| ROD Amendment for containment of PTMs issued (OU2) | 1996 |
| Removal actions: residential yards and common use areas start (OU3) | 1997 |
| Administrative Order on Consent with ASARCO for Gem Portal Pilot Project in Canyon Creek. | 1997 |
| RI/FS for Coeur d'Alene River Basin area (OU3) begins | 1998 |
| The USEPA issues a Unilateral Administrative Order (UAO) for a removal action to address spillage of metal concentrates along the UPRR right-of-way (ROW) | 1999 |
| First Five-Year Review Reports for OU1 and OU2 published | 2000 |
| 9th Circuit Court of Appeals confirms that the NPL facility includes all areas of the Coeur d'Alene Basin where mining contamination has come to be located. | 2000 |
| U.S. District Court approves the CD between UPRR, the State of Idaho, the Coeur d'Alene Tribe and the United States for the railroad ROW. Construction of the Trail of the Coeur d'Alene begins. | 2000 |
| U.S. District Court approves the CD between Sunshine Mining Company, the United States, and the Coeur d'Alene Tribe. | 2001 |
| U.S. District Court approves the CD between the United States and defendants Coeur and Callahan. | 2001 |
| First phase of trial regarding liability was conducted in district court in Boise, Idaho with Asarco and Hecla as principal defendants. | 2001 |
| ROD Amendment for Bunker Hill Mining and Metallurgical Complex Acid Mine Drainage issued (OU2) | 2001 |
| Basin Environmental Improvement Act of 2001 enacted by Idaho State Legislature; | 2001 |

Table 2-1. Summary of Major Events at the Bunker Hill Superfund Site from 1883 - 2003

| Event | Date |
|---|---|
| establishes the Basin Commission | |
| Box SSC amended to include OU1 property remedial actions | 2002 - 2004 |
| ROD for OU3 signed | 2002 |
| Basin Commission begins operation | 2002 |
| Hillsides revegetation planting completed (OU2) | 2002 |
| SSC for the Basin (OU3) | 2003 |
| Remedial Actions begin in the Basin (OU3) pursuant to the OU3 ROD | 2003 |

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# 3 Review of Selected Remedies for OU1

This section documents the studies and remedial actions completed in Operable Unit 1 (OU1). The information in this section is organized as follows:

- 3.1 Overview of the Selected Remedy, which includes Applicable or Relevant and Appropriate Requirements (ARARs)
- 3.2 Review of Site-Specific Work and Remedial Actions, which includes issues and recommendations
- 3.3 References

A protectiveness statement for OU1 is provided in Section 7 of this report. Figure 3-1 is a map of the communities in OU1, and Figure 3-2 is a timeline of key events.

## 3.1 Overview of Selected Remedy

The OU1 Selected Remedy and remedial action objectives (RAOs) are described in the 1991 Record of Decision (ROD) (USEPA, 1991) and the 1992 ROD (USEPA, 1992). The primary goal of the OU1 Selected Remedy is to reduce children's intake of lead from soil and dust sources to meet the following RAOs:

- Less than five percent of children with blood lead levels of 10 micrograms per deciliter (µg/dL) or greater; and,
- Less than one percent of children exceeding a blood lead level of 15 µg/dL.

The long-term strategy to achieve the blood lead goals is to remediate surface soils through removals and replacement with clean soil or other barriers, and to stabilize other contaminated areas throughout the Site to effect reductions in house dust lead levels. The 1991 OU1 ROD and previous investigations identified house dust as the primary source of lead intake and subsequent absorption among young children in OU1 (PHD, 1986). This pattern has been widely observed and supported by many subsequent studies (Lanphear and Roghmann, 1997; Succop et al., 1998; Manton et al., 2000; Lanphear et al., 2002; Lanphear et al., 2003).

To achieve the RAOs, the cleanup strategy includes:

- Implementation of a lead health intervention program for local families;
- Remediation of all residential yards, commercial properties, and rights-of-way (ROWs) that have soil lead concentrations greater than 1,000 milligrams per kilogram (mg/kg);

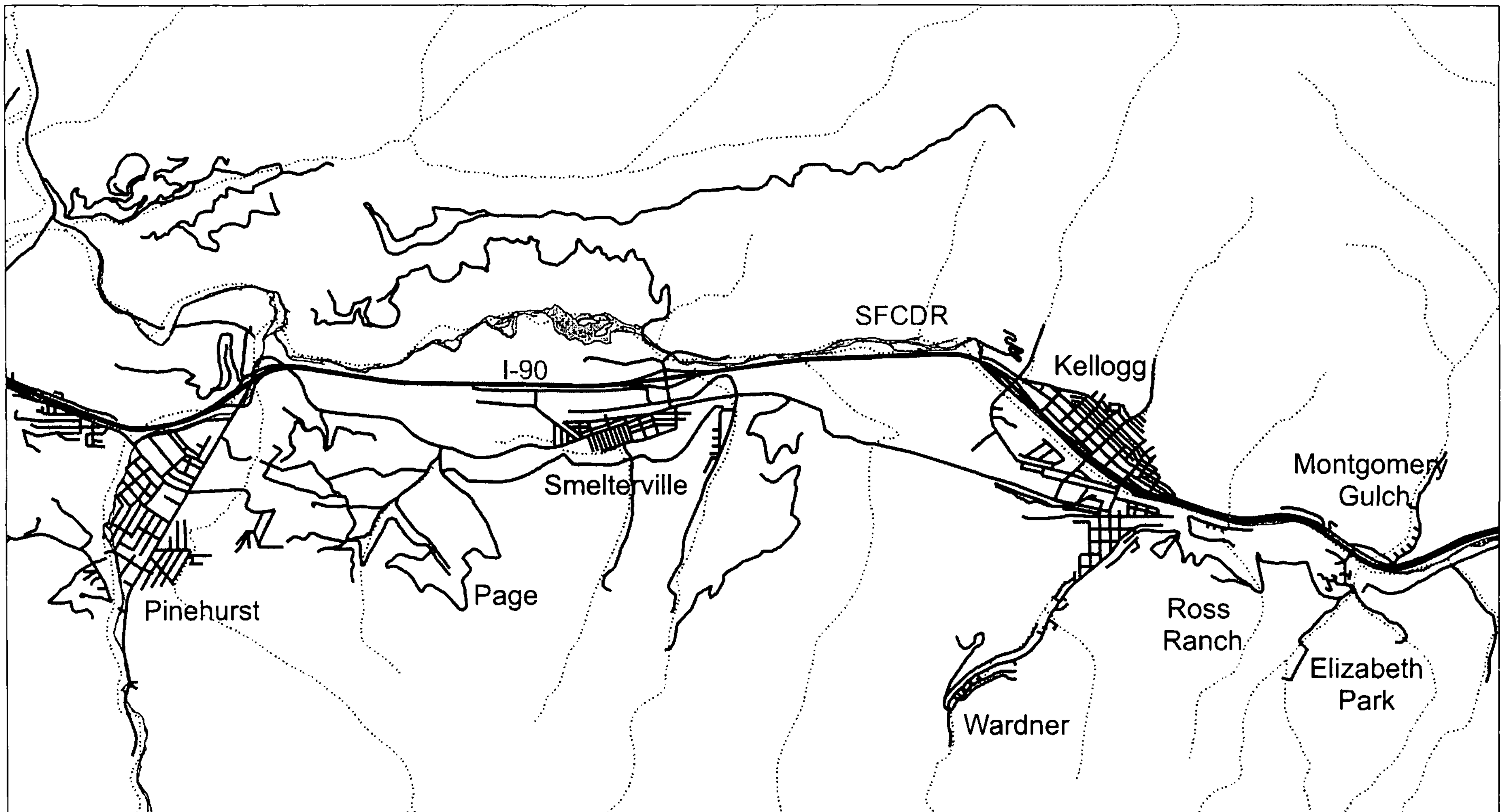



FIGURE 3-1

**MAP OF COMMUNITIES IN OU1**

FIVE-YEAR REVIEW

E112004005SEA . 321104.FR.01 . Map of Communities in OU1 . 16may05 . gr

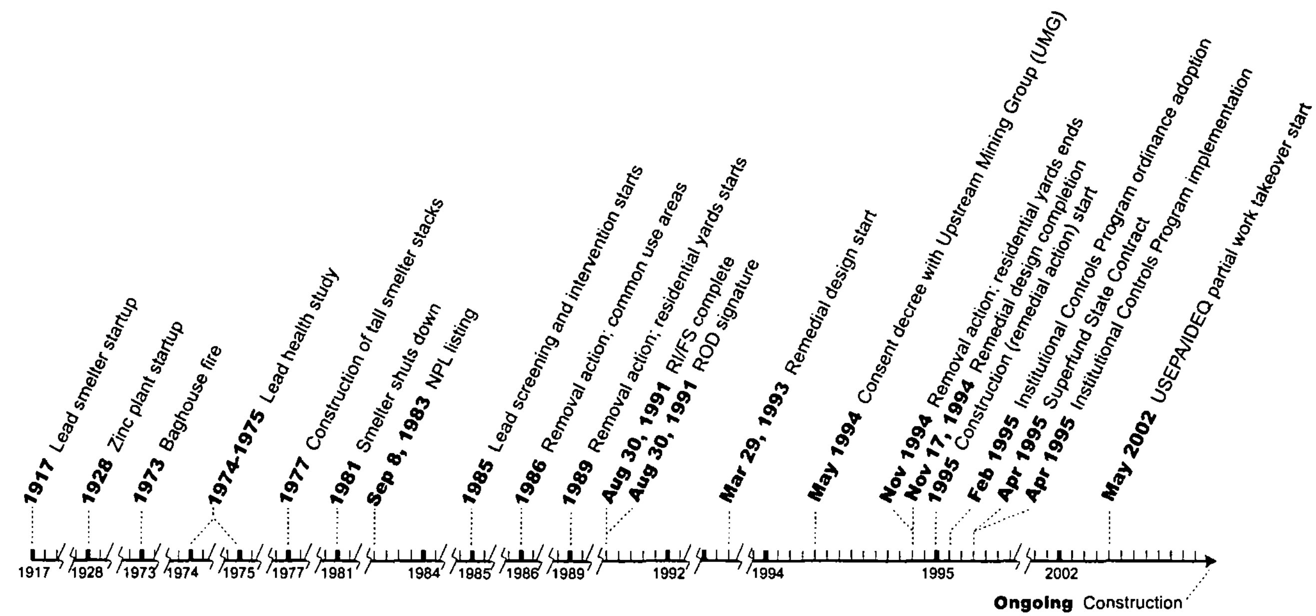



FIGURE 3-2

**OU1 TIMELINE**
**BUNKER HILL SUPERFUND SITE**

FIVE-YEAR REVIEW

E112004005SEA . 321104.FR.01 . 3-2 OU1 Timeline.ai . 16may05

- Achieving a geometric mean yard soil lead concentration of less than 350 mg/kg for each residential community in OU1;
- Controlling fugitive dust and stabilizing and capping contaminated soils throughout the Bunker Hill Box (OU1/OU2);
- Achieving a geometric mean of interior house dust lead levels for each community of 500 mg/kg or less, with no individual house dust level exceeding 1,000 mg/kg; and,
- Establishing an Institutional Controls Program (ICP) to maintain protective barriers over time, and to ensure that future land use and development is compatible with the OU1 Selected Remedy.

In 1994, the U.S. Environmental Protection Agency (USEPA) and the State of Idaho entered into a Consent Decree (CD) with the Potentially Responsible Parties (PRPs) to conduct remedial actions in OU1.[1] The OU1 PRPs also are referred to as the Upstream Mining Group (UMG), which is currently comprised of Asarco Inc. and Hecla Mining Company. Among other things, the CD requires the PRPs to remediate at least 200 residential yards and associated ROWs and commercial properties each year until all residential areas are completed.

### 3.1.1 ARARs Review

In the first five-year review for OU1 (USEPA, 2000), the ARARs and To Be Considered (TBC) from the 1991 OU1 ROD and the 1992 Operable Unit 2 (OU2) ROD were reviewed. Changes or newly promulgated standards were identified related to air and blood lead level goals. However, the modifications were found not to affect the protectiveness of the remedy selected in the 1991 and 1992 RODs. Since that time, promulgated standards affecting the protectiveness of the OU1 human health remedy have remained unchanged. Section 4.1.1 of this report provides a brief discussion of the revised and new standards that have been evaluated since the last five-year review.

## 3.2 Review of Site-Specific Work and Remedial Actions

### 3.2.1 Actions Since Last Five-Year Review

#### 3.2.1.1 Residential Soil Remediation

From 1994 to the present, the PRPs have implemented the OU1 residential remediation program. Since the last five-year review for OU1 (USEPA, 2000), the PRPs completed cleanup in the community of Kellogg, north of Interstate 90 (I-90) in 2001. The USEPA certified the PRPs work in north Kellogg complete in 2004. As part of the completion certification, the PRPs provided a cash-out payment to the State of Idaho for remediation refusals. Remediation refusals refer to properties where the owner has refused soil remediation or well closures. The PRPs provide a cash payment to the State of Idaho for the

[1] Consent Decree; Bunker Hill; United States of America and State of Idaho v. ASARCO Incorporated, Coeur d'Alene Mines Corporation, Callahan Mining Corporation, Hecla Mining Company, Sunshine Precious Metals, Sunshine Mining Company; Civil Action No. 94-0206-N-HLR; May 10, 1994.

estimated cost of remediating the property. The payment is deposited in a trust fund held by the State for property remediation if the property owner changes their mind or a new owner acquires the property and agrees to clean up. As part of the Kellogg north of I-90 completion, the PRPs provided a cash payment of $213,408 for eight yard refusals and three well closure refusals.

Starting in 2001 and continuing through 2004, the PRPs did not fully comply with the CD work obligations. Therefore, the USEPA and the Idaho Department of Environmental Quality (IDEQ) partially took over the populated areas cleanup using a scoping, design, and remediation process similar to the one used by the PRPs. The USEPA and the IDEQ conducted cleanup work during the 2002–2004 construction seasons. The USEPA and the IDEQ expect the PRPs to fully implement the CD work obligations from 2005 forward.

### *Yard Soil Remediation Progress*

By the end of the 2004 construction season, about 2,000 yards, or approximately 95 percent of all of the homes exceeding the soil action level, were remediated in OU1. Table 3-1 describes the percent of yards remediated out of the total number of yards requiring remediation by community. Table 3-2 and Figures 3-3 and 3-4 summarize the residential yard soil remediation progress. Cleanup activities have been initiated in the communities of Montgomery Gulch, Elizabeth Park, and Ross Ranch. All residential remediation is expected to be completed by 2006.

**Table 3-1. Percent of Yards Remediated, and Estimated Number of Yards Remaining to be Remediated**

| City | 1988 Remediated | 2004 Remediated Total[b] | Estimated Number of Remaining Yards[b] |
|---|---|---|---|
| Kellogg[a] | 0% (0) | 96% (1,113) | 44 |
| Page | 0% (0) | 50% (27) | 27 |
| Pinehurst | 0% (0) | 93% (204) | 16 |
| Smelterville | 0% (0) | 100% (305) | 0 |
| Wardner | 0% (0) | 98% (197) | 4 |
| **Total** | 0% (0) | 95% (1,846) | 91 |

[a] Kellogg includes outlying communities such as Elizabeth Park, Montgomery Gulch, and Ross Ranch.
[b] These numbers are estimated from the PRP soil database for residential yards only. In its 2005 Work Plan, UMG reports that 134 residential yards and discrete areas remain to be remediated and will be addressed this year. Discrete areas include driveways and play areas (UMG, 2005a).

### *Yard Soil Lead Concentrations*

Surface yard soil lead concentrations are evaluated for risk assessments and attainment of the RAOs because surface soil represents the soil that is most available for exposure to young children. The remedy requires the installation of protective barriers of 6 to 12 inches (depending on depth of contamination) to reduce direct exposure to contaminated soil and migration of contaminated soil to dust in homes.

**Table 3-2. Yard Soil Remediation Progress, 1989-2004**

| Year | City | Number of Residential Units[a] | Yards Above Action Level This Year[b] | | Yards Remediated This Year[b] | | Number (%) Remediated Total | | Mean Soil Lead Concentration (mg/kg) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | No. | % | No. | % | | | Arithmetic Mean | Standard Deviation | Geometric Mean | Standard Deviation |
| **1989** | Kellogg | 1513 | 1157 | 76% | 73 | 6% | 73 | 6% | 2703 | 2673 | 1774 | 2.84 |
| | Page | 75 | 54 | 72% | 6 | 11% | 6 | 11% | 645 | 770 | 329 | 3.34 |
| | Pinehurst | 950 | 220 | 23% | 1 | 0% | 1 | 0% | 580 | 520 | 426 | 2.28 |
| | Smelterville | 409 | 305 | 75% | 17 | 6% | 17 | 6% | 3375 | 3123 | 2101 | 2.99 |
| | Wardner[c] | 148 | 201 | 100% | 7 | 3% | 7 | 3% | 2317 | 3422 | 1335 | 2.85 |
| | Total | 3095 | 1937 | 63% | 104 | 5% | 104 | 5% | — | — | — | — |
| **1990** | Kellogg | 1513 | 1084 | 72% | 105 | 10% | 178 | 15% | 2545 | 2664 | 1489 | 3.39 |
| | Page | 75 | 48 | 64% | 2 | 4% | 8 | 15% | 609 | 756 | 304 | 3.33 |
| | Pinehurst | 950 | 219 | 23% | 0 | 0% | 1 | 0% | 580 | 519 | 425 | 2.29 |
| | Smelterville | 409 | 288 | 70% | 18 | 6% | 35 | 11% | 3219 | 3127 | 1817 | 3.49 |
| | Wardner | 148 | 194 | 97% | 21 | 11% | 28 | 14% | 2248 | 3389 | 1230 | 3.09 |
| | Total | 3095 | 1833 | 59% | 146 | 8% | 250 | 13% | — | — | — | — |
| **1991** | Kellogg | 1513 | 979 | 65% | 53 | 5% | 231 | 20% | 2348 | 2639 | 1198 | 3.99 |
| | Page | 75 | 46 | 61% | 3 | 7% | 11 | 20% | 598 | 751 | 297 | 3.32 |
| | Pinehurst | 950 | 219 | 23% | 1 | 0% | 2 | 1% | 580 | 519 | 425 | 2.29 |
| | Smelterville | 409 | 270 | 66% | 20 | 7% | 55 | 18% | 3069 | 3123 | 1580 | 3.93 |
| | Wardner | 148 | 173 | 86% | 3 | 2% | 31 | 15% | 2062 | 3295 | 990 | 3.63 |
| | Total | 3095 | 1687 | 55% | 80 | 5% | 330 | 17% | — | — | — | — |
| **1992** | Kellogg | 1513 | 926 | 61% | 54 | 6% | 285 | 25% | 2197 | 2631 | 1038 | 4.24 |
| | Page | 75 | 43 | 57% | 3 | 7% | 14 | 26% | 503 | 597 | 266 | 3.12 |
| | Pinehurst | 950 | 218 | 23% | 13 | 6% | 15 | 7% | 579 | 520 | 424 | 2.29 |
| | Smelterville | 409 | 250 | 61% | 11 | 4% | 66 | 22% | 2758 | 2981 | 1286 | 4.33 |
| | Wardner | 148 | 170 | 85% | 3 | 2% | 34 | 17% | 2031 | 3298 | 954 | 3.70 |
| | Total | 3095 | 1607 | 52% | 84 | 5% | 414 | 21% | — | — | — | — |
| **1993** | Kellogg | 1513 | 872 | 58% | 17 | 2% | 302 | 26% | 2070 | 2620 | 908 | 4.47 |
| | Page | 75 | 40 | 53% | 2 | 5% | 16 | 30% | 466 | 582 | 246 | 3.05 |
| | Pinehurst | 950 | 205 | 22% | 9 | 4% | 24 | 11% | 562 | 500 | 411 | 2.30 |
| | Smelterville | 409 | 239 | 58% | 5 | 2% | 71 | 23% | 2600 | 2904 | 1151 | 4.51 |
| | Wardner | 148 | 167 | 83% | 4 | 2% | 38 | 19% | 2017 | 3303 | 925 | 3.78 |
| | Total | 3095 | 1523 | 49% | 37 | 2% | 451 | 23% | — | — | — | — |

**Table 3-2. Yard Soil Remediation Progress, 1989-2004**

| Year | City | Number of Residential Units[a] | Yards Above Action Level This Year[b] | | Yards Remediated This Year[b] | | Number (%) Remediated Total | | Mean Soil Lead Concentration (mg/kg) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | No. | % | No. | % | | | Arithmetic Mean | Standard Deviation | Geometric Mean | Standard Deviation |
| **1994** | Kellogg | 1513 | 855 | 57% | 29 | 3% | 331 | 29% | 2028 | 2619 | 869 | 4.53 |
| | Page | 75 | 38 | 51% | 2 | 5% | 18 | 33% | 434 | 558 | 232 | 2.97 |
| | Pinehurst | 950 | 196 | 21% | 4 | 2% | 28 | 13% | 551 | 490 | 403 | 2.30 |
| | Smelterville | 409 | 234 | 57% | 73 | 31% | 144 | 47% | 2529 | 2858 | 1095 | 4.59 |
| | Wardner | 148 | 163 | 81% | 8 | 5% | 46 | 23% | 1952 | 3289 | 874 | 3.85 |
| | Total | 3095 | 1486 | 48% | 116 | 8% | 567 | 29% | — | — | — | — |
| **1995** | Kellogg | 1513 | 826 | 55% | 32 | 4% | 363 | 31% | 1939 | 2493 | 806 | 4.61 |
| | Page | 75 | 36 | 48% | 1 | 3% | 19 | 35% | 411 | 548 | 220 | 2.91 |
| | Pinehurst | 950 | 192 | 20% | 4 | 2% | 32 | 15% | 548 | 490 | 400 | 2.31 |
| | Smelterville | 409 | 161 | 39% | 139 | 86% | 283 | 93% | 1759 | 2728 | 547 | 5.06 |
| | Wardner | 148 | 155 | 77% | 0 | 0% | 46 | 23% | 1807 | 3222 | 778 | 3.93 |
| | Total | 3095 | 1370 | 44% | 176 | 13% | 743 | 38% | — | — | — | — |
| **1996** | Kellogg | 1513 | 794 | 52% | 146 | 18% | 509 | 44% | 1869 | 2481 | 745 | 4.71 |
| | Page | 75 | 35 | 47% | 0 | 0% | 19 | 35% | 391 | 523 | 213 | 2.84 |
| | Pinehurst | 950 | 188 | 20% | 5 | 3% | 37 | 17% | 545 | 489 | 397 | 2.31 |
| | Smelterville | 409 | 22 | 5% | 18 | 82% | 301 | 99% | 376 | 1151 | 156 | 2.54 |
| | Wardner | 148 | 155 | 77% | 1 | 1% | 47 | 23% | 1807 | 3222 | 778 | 3.93 |
| | Total | 3095 | 1194 | 39% | 170 | 14% | 913 | 47% | — | — | — | — |
| **1997** | Kellogg | 1513 | 648 | 43% | 183 | 28% | 692 | 60% | 1510 | 2274 | 520 | 4.85 |
| | Page | 75 | 35 | 47% | 2 | 6% | 21 | 39% | 391 | 523 | 213 | 2.84 |
| | Pinehurst | 950 | 183 | 19% | 3 | 2% | 40 | 18% | 542 | 490 | 394 | 2.32 |
| | Smelterville | 409 | 4 | 1% | 0 | 0% | 301 | 99% | 180 | 258 | 132 | 1.88 |
| | Wardner | 148 | 154 | 77% | 4 | 3% | 51 | 25% | 1797 | 3224 | 767 | 3.95 |
| | Total | 3095 | 1024 | 33% | 192 | 19% | 1105 | 57% | — | — | — | — |
| **1998** | Kellogg | 1513 | 465 | 31% | 161 | 35% | 853 | 74% | 1175 | 2204 | 340 | 4.66 |
| | Page | 75 | 33 | 44% | 3 | 9% | 24 | 44% | 337 | 386 | 199 | 2.67 |
| | Pinehurst | 950 | 180 | 19% | 4 | 2% | 44 | 20% | 538 | 483 | 391 | 2.32 |
| | Smelterville | 409 | 4 | 1% | 4 | 100% | 305 | 100% | 180 | 258 | 132 | 1.88 |
| | Wardner | 148 | 150 | 75% | 0 | 0% | 51 | 25% | 1725 | 3103 | 736 | 3.98 |
| | Total | 3095 | 832 | 27% | 172 | 21% | 1277 | 66% | — | — | — | — |

**Table 3-2. Yard Soil Remediation Progress, 1989-2004**

| Year | City | Number of Residential Units[a] | Yards Above Action Level This Year[b] | | Yards Remediated This Year[b] | | Number (%) Remediated Total | | Mean Soil Lead Concentration (mg/kg) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | No. | % | No. | % | | | Arithmetic Mean | Standard Deviation | Geometric Mean | Standard Deviation |
| **1999** | Kellogg | 1513 | 304 | 20% | 17 | 6% | 870 | 75% | 841 | 1989 | 232 | 3.98 |
| | Page | 75 | 30 | 40% | 0 | 0% | 24 | 44% | 301 | 350 | 184 | 2.54 |
| | Pinehurst | 950 | 176 | 19% | 48 | 27% | 92 | 42% | 533 | 481 | 387 | 2.33 |
| | Smelterville | 409 | 0 | 0% | 0 | 0% | 305 | 100% | 162 | 151 | 129 | 1.77 |
| | Wardner | 148 | 150 | 75% | 6 | 4% | 57 | 28% | 1725 | 3103 | 736 | 3.98 |
| | Total | 3095 | 660 | 21% | 71 | 11% | 1348 | 70% | — | — | — | — |
| **2000** | Kellogg | 1513 | 287 | 19% | 10 | 3% | 880 | 76% | 782 | 1871 | 222 | 3.85 |
| | Page | 75 | 30 | 40% | 0 | 0% | 24 | 44% | 301 | 350 | 184 | 2.54 |
| | Pinehurst | 950 | 128 | 13% | 57 | 45% | 149 | 68% | 486 | 450 | 349 | 2.35 |
| | Smelterville | 409 | 0 | 0% | 0 | 0% | 305 | 100% | 162 | 151 | 129 | 1.77 |
| | Wardner | 148 | 144 | 72% | 0 | 0% | 57 | 28% | 1690 | 3111 | 691 | 4.09 |
| | Total | 3095 | 589 | 19% | 67 | 11% | 1415 | 73% | — | — | — | — |
| **2001** | Kellogg | 1513 | 277 | 18% | 9 | 3% | 889 | 77% | 757 | 1849 | 216 | 3.78 |
| | Page | 75 | 30 | 40% | 0 | 0% | 24 | 44% | 301 | 350 | 184 | 2.54 |
| | Pinehurst | 950 | 71 | 7% | 49 | 69% | 198 | 90% | 425 | 410 | 305 | 2.33 |
| | Smelterville | 409 | 0 | 0% | 0 | 0% | 305 | 100% | 162 | 151 | 129 | 1.77 |
| | Wardner | 148 | 144 | 72% | 5 | 3% | 62 | 31% | 1690 | 3111 | 691 | 4.09 |
| | Total | 3095 | 522 | 17% | 63 | 12% | 1478 | 76% | — | — | — | — |
| **2002** | Kellogg | 1513 | 268 | 18% | 104 | 39% | 993 | 86% | 740 | 1840 | 212 | 3.73 |
| | Page | 75 | 30 | 40% | 0 | 0% | 24 | 44% | 301 | 350 | 184 | 2.54 |
| | Pinehurst | 950 | 22 | 2% | 6 | 27% | 204 | 93% | 371 | 320 | 274 | 2.27 |
| | Smelterville | 409 | 0 | 0% | 0 | 0% | 305 | 100% | 162 | 151 | 129 | 1.77 |
| | Wardner | 148 | 139 | 69% | 3 | 2% | 65 | 32% | 1631 | 3087 | 649 | 4.14 |
| | Total | 3095 | 459 | 15% | 113 | 25% | 1591 | 82% | — | — | — | — |
| **2003** | Kellogg | 1513 | 164 | 11% | 88 | 54% | 1081 | 93% | 408 | 1004 | 161 | 2.83 |
| | Page | 75 | 30 | 40% | 0 | 0% | 24 | 44% | 301 | 350 | 184 | 2.54 |
| | Pinehurst | 950 | 16 | 2% | 0 | 0% | 204 | 93% | 360 | 254 | 270 | 2.25 |
| | Smelterville | 409 | 0 | 0% | 0 | 0% | 305 | 100% | 162 | 151 | 129 | 1.77 |
| | Wardner | 148 | 136 | 68% | 28 | 21% | 93 | 46% | 1604 | 3087 | 626 | 4.18 |
| | Total | 3095 | 346 | 11% | 116 | 34% | 1707 | 88% | — | — | — | — |

**Table 3-2. Yard Soil Remediation Progress, 1989-2004**

| Year | City | Number of Residential Units[a] | Yards Above Action Level This Year[b] | | Yards Remediated This Year[b] | | Number (%) Remediated Total | | Mean Soil Lead Concentration (mg/kg) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | No. | % | No. | % | | | Arithmetic Mean | Standard Deviation | Geometric Mean | Standard Deviation |
| 2004 | Kellogg | 1513 | 76 | 5% | 32 | 42% | 1113 | 96% | 231 | 620 | 131 | 2.10 |
| | Page | 75 | 30 | 40% | 3 | 10% | 27 | 50% | 301 | 350 | 184 | 2.54 |
| | Pinehurst | 950 | 16 | 2% | 0 | 0% | 204 | 93% | 360 | 254 | 270 | 2.25 |
| | Smelterville | 409 | 0 | 0% | 0 | 0% | 305 | 100% | 162 | 151 | 129 | 1.77 |
| | Wardner | 148 | 108 | 54% | 104 | 96% | 197 | 98% | 1044 | 1531 | 430 | 3.99 |
| | Total | 3095 | 230 | 7% | 139 | 60% | 1846 | 95% | --- | --- | --- | --- |

[a]Estimated from tax assessor parcel maps.
[b]Based on PRP soil database, residential yards only. Numbers will vary from PRP summaries because discrete areas were not counted here. 100 percent agreement between the tax assessor and the PRP soil database is not expected.
[c]The estimated number of residential units (from tax assessor) and yards above the action level (from PRP soil database) for Wardner are different. The PRP database estimates 201 yards require remediation, which is greater than the estimated number of yards from the assessor's files. In this table, the number and percentage of yards above the action level for Wardner were calculated using 201 (not 148).
Note: Kellogg includes outlying communities such as Elizabeth Park and Montgomery Gulch.
mg/kg = milligrams per kilogram
--- = Not applicable

Figure 3-3
Community Geometric Mean Soil Lead Concentration and Progress Towards Remedial Action Objective (RAO), 1989-2004

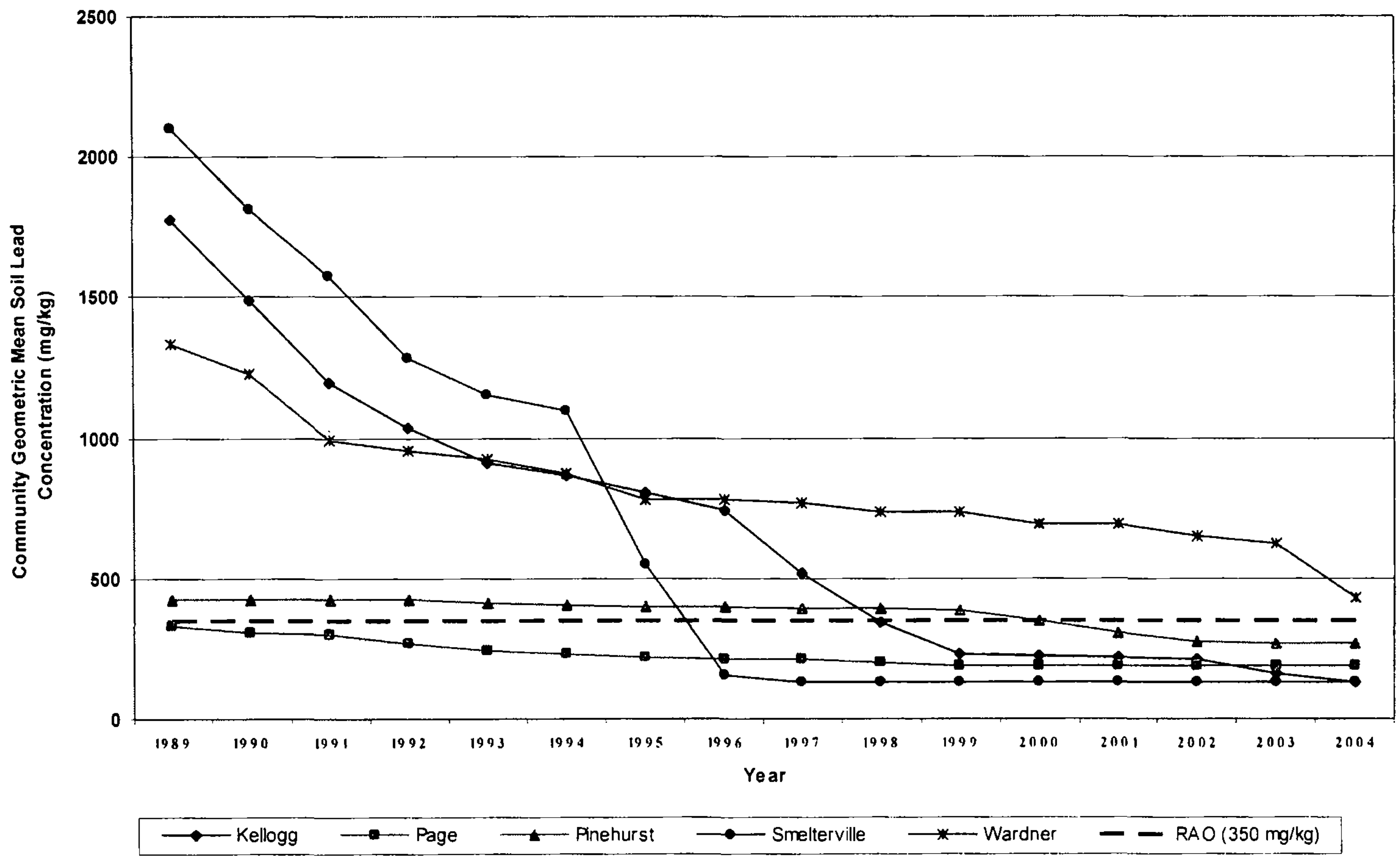
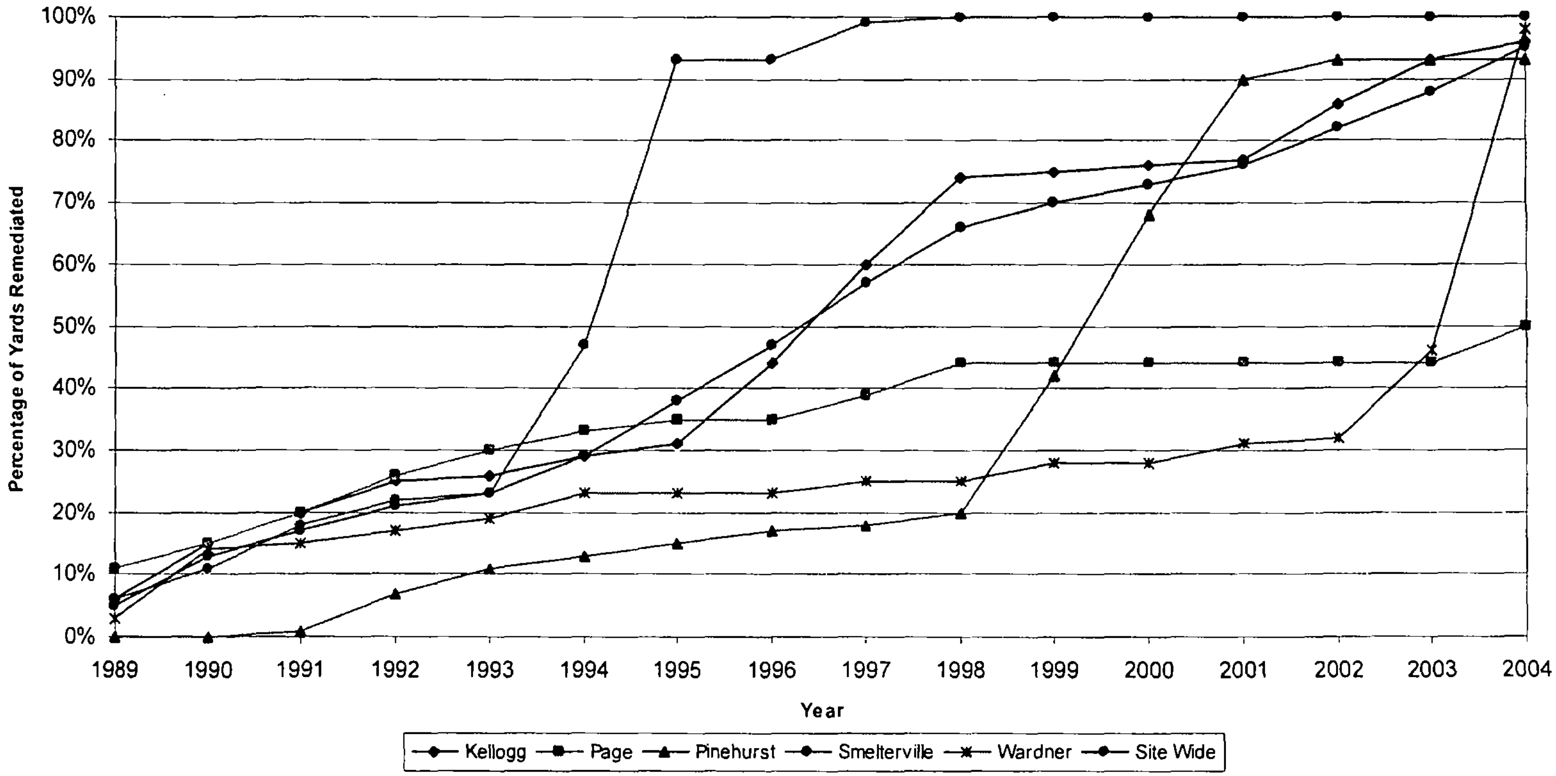


**Figure 3-4**
**Percentage of Yard Remediations Completed by City, 1989-2004[a]**




[a]The number of residential properties was originally estimated from tax assessor parcel maps. The number of remediated residential yards is based on the PRP soil database, which is not based on tax assessor parcel maps. Therefore, 100% agreement between counts is not expected.
Note: Kellogg includes outlying communities such as Elizabeth Park and Montgomery Gulch.

Between 1989 and 2004, lead concentrations in the top inch of yard soils was significantly reduced in the communities of Smelterville, Kellogg, Page, Wardner, and Pinehurst (Table 3-3). Generally, community mean yard soil concentrations decreased by about 100 to 300 mg/kg annually in the earlier years of remediation and by about 30 to 50 mg/kg annually in more recent years. Although the Wardner community mean yard soil concentration is reported as 430 mg/kg in Table 3-3, this concentration does not account for all the yard remediations completed in 2004. The majority of Wardner residential yards were remediated in 2004, resulting in the installation of clean soil barriers of 100 mg/kg lead or less. Therefore, once remediation is completed and new surface soil concentrations are evaluated, it is expected that the Wardner community mean yard soil lead concentrations will be close to 150 mg/kg.

**Table 3-3. Observed Decrease in Geometric Mean Yard Soil Lead Concentrations by City**

| City | 1988 (mg/kg) | 2004 (mg/kg) | Percent Decrease | RAO (mg/kg) |
|---|---|---|---|---|
| Kellogg[a] | 1774 | 131 | 93% | 350 |
| Page | 329 | 184 | 44% | 350 |
| Pinehurst | 426 | 270 | 37% | 350 |
| Smelterville | 2101 | 129 | 94% | 350 |
| Wardner | 1335 | 430 | 68% | 350 |

[a] Kellogg includes outlying communities such as Elizabeth Park, Montgomery Gulch, and Ross Ranch.

Table 3-2 summarizes surface (top inch) soil lead concentration data for each community in the Box from 1989 to 2004. These data represent all home yards in each city. Figure 3-3 shows the mean community-wide yard soil concentrations and the 350 mg/kg RAO by year since initiation of the yard soil cleanup activities in 1989. Figure 3-4 shows the percent of estimated total yard remedial actions that have been completed, by year, since 1989.

Since yard soil remediation is limited to the top 6 to 12 inches of contaminated soils, contamination at-depth remains largely unchanged within the Box (see Section 3.2.1.7). Most of the sub-soils contained under the one-foot clean soil barrier have lead concentrations above 1,000 mg/kg in Smelterville and Kellogg. Ensuring that these protective barriers are maintained over time is a critical function of the ICP.

### Rights-of-Way Soil Concentrations

In the first five-year review for OU1 (USEPA, 2000), the USEPA recommended further investigation of right-of-way recontamination issues. The majority of ROWs in the Box are graveled roadside areas exposed to vehicular traffic. Recontamination of ROWs in Smelterville was noted between 1996 and 1999. Several issues that could affect the protectiveness of the remedy were identified in the first five-year review, including: vehicle tracking, erosion from nearby hillsides, lack of infrastructure and drainage maintenance to control recurrent flooding, and lack of road maintenance to contain underlying contamination. ROWs identified in the cleanup plan include primary highways, roads, and road shoulders; city streets and alleys; utility substations; and corridors. In general, any

ROW with soil concentrations exceeding 1,000 mg/kg lead is remediated to the same criteria as adjacent residential or commercial properties.

Nearly 120 ROWs have been monitored over the last 5 years, with samples collected from three depth intervals. Both metals concentrations in the barrier material and the thickness of the barrier are monitored. With regard to barrier durability, some installed ROW barriers have eroded to less than 6 inches thick, with recorded depths down to one inch. This is likely due to dislocation and/or compaction of clean gravel and soil because ROWs have the most use (e.g., vehicular traffic on road shoulders and in alleys). Compaction or dislocation of 12-inch barriers has also been noted. In areas where ROWs have been remediated without underlying marker fabric (e.g., where the soil lead concentration below the protective barrier is less than 1,000 mg/kg), it is often difficult to determine if soil lead concentrations reflect surface recontamination or a degraded barrier that has exposed subsurface contamination.

While it is clear that ROW recontamination has occurred, ROW lead concentrations seem to have stabilized in Smelterville since 1999. Smelterville mean lead concentrations in the top inch have ranged from 250 mg/kg to 315 mg/kg, with an average of 8 percent of samples above 1,000 mg/kg, and an average of 13 percent remaining below the 100 mg/kg clean soil criteria. The majority of samples in the top inch indicate some level of contamination between 100 mg/kg and 1,000 mg/kg lead. The 1- to 6-inch and 6- to 12-inch intervals show lower mean concentrations but also show an average of 12 percent and 17 percent of samples above 1,000 mg/kg, respectively. About half (50 percent) of samples in the 1- to 6-inch and 6- to 12-inch interval remain below the clean soil level of 100 mg/kg (TerraGraphics, 2005a). There are indications of low levels of surface soil recontamination in both Kellogg and Pinehurst.

Widespread recontamination of ROWs to levels of human health concern has not been observed to date. However, surface and subsurface contamination remaining in the Box and the lack of adequate infrastructure to protect against flooding poses a risk of recontamination. In general, the remediation has been effective in capping contamination but may not be sustainable in areas such as road shoulders and alleys, where heavy use may cause dislocation and compaction.

#### *Hillside Sloughing*

In the first five-year review, sloughing of soil from contaminated hillsides onto adjacent remediated yards was identified as an issue. The report recommended that wall construction or other best management practices (BMPs) be considered as well as appropriate planning and zoning changes to prevent development immediately adjacent to contaminated hillsides or modifications to hillsides that exacerbate erosion. Since the first five-year review for OU1 (USEPA, 2000), the USEPA and the IDEQ have completed additional hillsides stabilization activities for residential yards adjacent to hillsides in the communities of Kellogg, Wardner, and Smelterville. Some of these hillside stabilization activities were conducted as part of the yard remediation program and are not separately identified in this report. Sections 4.3.1 and 4.3.14 provide a summary of the hillside stabilization activities that have taken place outside of the yard remediation program to date.

### *Mine Dumps*

The RODs call for stabilization of mine dumps as they relate to erosion off of hillsides. The first five-year review concluded that no further actions on hillside mine dumps were warranted at that time from a human health perspective. As the USEPA and the State of Idaho work with the PRPs to complete the residential remediation program, the governments will evaluate if new information has arisen regarding erosion or access concerns from mine dumps on hillsides adjacent to residential yards. If new information arises, an update will be provided in the next five-year review report.

### *Air Monitoring*

The first five-year review recommended that air monitoring be continued and to take corrective actions if needed. The air monitoring program was originally implemented to monitor the fugitive dust source areas and other aerial emissions originating from the industrial complex. These sources have been essentially eliminated as part of the Box cleanup. Monitoring was continued to ensure that large-scale dirt moving remediation projects did not cause an air quality problem. In the last 5 years, thousands of data points from personal monitors on workers at yard remediation sites have shown that the yard remediation program is not a generator of fugitive dust to cause harm to public health (UMG, 2005b). In addition, Box monitoring data from 2000-2003 did not show any exceedances for total suspended particulates and concentrations of lead, arsenic, and cadmium in airborne dust (Garry Struthers, 2000; Spring Environmental, 2001; Herrera, 2002; Herrera, 2003.). Therefore, the decision was made to discontinue OU1 air monitoring in 2004. For more air monitoring information, see Section 4.4.2.

### 3.2.1.2 House Dust Remediation

Following completion of soil remediation in a community, the remedy includes a one-time interior cleaning for any home with house dust concentrations at or above 1,000 mg/kg. The rationale for not performing interior cleaning at the time of soil remediation derived from a 1990 pilot cleaning study in which some homes in the Box received comprehensive interior cleaning yet, within one year, lead concentrations in the home had returned to pre-cleaning levels (CH2M HILL, 1991). As a result, the USEPA, the IDEQ, the Agency for Toxic Substances and Disease Registry (ATSDR), and the PHD agreed that home interiors would not be remediated until exterior contamination sources were controlled. In the meantime, the USEPA and the State of Idaho have conducted an interior cleaning pilot project and ongoing monitoring of house dust lead concentrations.

### *2000 Interior Cleaning Pilot Project*

As a follow-up to the 1990 interior cleaning pilot project, the USEPA and the State of Idaho conducted a second house dust pilot project in 2000. The purpose of the 2000 house dust pilot project was to assess the long-term effectiveness and costs for a one-time interior cleaning program in a community where soil remediation was completed. Homes in the community of Smelterville were selected because soil remediation in the community had been certified complete in 1998. The pilot project involved the interior cleaning of 18 houses in Smelterville, and cleaning was limited to accessible areas of the residence and air ducts. Five additional control houses in Smelterville were not cleaned but were sampled using the same methodologies as the houses undergoing interior remediation. Participating houses were grouped into four distinct treatment groups, ranging from a complete cleaning with carpet and furniture replacement (i.e., Housing and Urban Development [HUD] cleaning) to a one-day spring cleaning without air ducts, steam cleaning, or using federal oversight (TerraGraphics, 2002). The conclusions drawn from the pilot project were that sustained reductions in lead dust concentrations would require frequent and repeated interior cleanings by either HUD carpet replacement and/or comprehensive commercial cleaning protocols, otherwise dust lead levels would return to pre-cleaning levels within months (TerraGraphics, 2002).

#### *House Dust Lead Concentrations*

The USEPA and the State of Idaho are continuing to monitor house dust concentrations as residential soil remediation is completed. House dust has long been recognized as the predominant source of exposure for young children within the Box. House dust concentrations are being measured to assess progress towards meeting the objective of a 500-mg/kg lead dust community average and an individual goal for each home of 1,000 mg/kg lead or less. Two different methods are being used to track the concentration of dust in the home: vacuum bags and dust mats (TerraGraphics, 2000). In addition to providing concentration data, dust mats provide dust and lead loading rates. These additional data are useful because dust lead concentrations represent the ratio of lead to dust, they do not account for the mass of lead available for exposure. Lead loading rates provide additional information regarding the mass of lead being tracked from outside of the house to the interior. Dust loading represents the mass of dust per unit area. It is estimated that a majority of lead in interior house dust originates from exterior soils (TerraGraphics, 2005a).

In the first five-year review, decreasing house dust lead concentrations were observed; however, OU1 community means were not below 500 mg/kg. The decreasing trend in dust lead concentrations has continued and, since 2002, all community mean concentrations have been below 500 mg/kg (see Figure 3-5 and Table 3-4).

Although the community mean has been achieved in all cities, there are still individual houses throughout OU1 with dust lead concentrations exceeding 1,000 mg/kg. However, these houses are not necessarily the same each year since house dust lead concentrations may vary within the same home over several years of observation. For example, from 1999 to 2004, 350 homes in OU1 had either a dust mat or vacuum bag sample (or both) greater than 1,000 mg/kg lead. Of these 350 homes, 61 (17 percent) exceeded 1,000 mg/kg lead two years or more. The percentage of individual homes in OU1 with dust levels greater than 1,000 mg/kg was below 20 percent in 2000 but has been less than or equal to 10 percent from 2001 to the present. In 2004, approximately 7 percent of all homes (11 homes) had samples with lead concentrations greater than 1,000 mg/kg, as noted in Table 3-5 (TerraGraphics, 2005a).

### 3.2.1.3 Blood Lead Levels

The first five-year review for OU1 concluded that children's blood lead concentrations and interior house dust concentrations were declining as residential soil cleanup was completed (Figure 3-6). The 2000 report recommended annual blood lead screening to document whether the reductions in blood lead concentrations would be sustained (USEPA, 2000). From 2000 to 2002, the USEPA and the State of Idaho noted significant additional reductions in house dust lead and blood lead concentrations.

**Figure 3-5**
**House Dust Vacuum Bag Lead Concentration by City, 1988-2004**

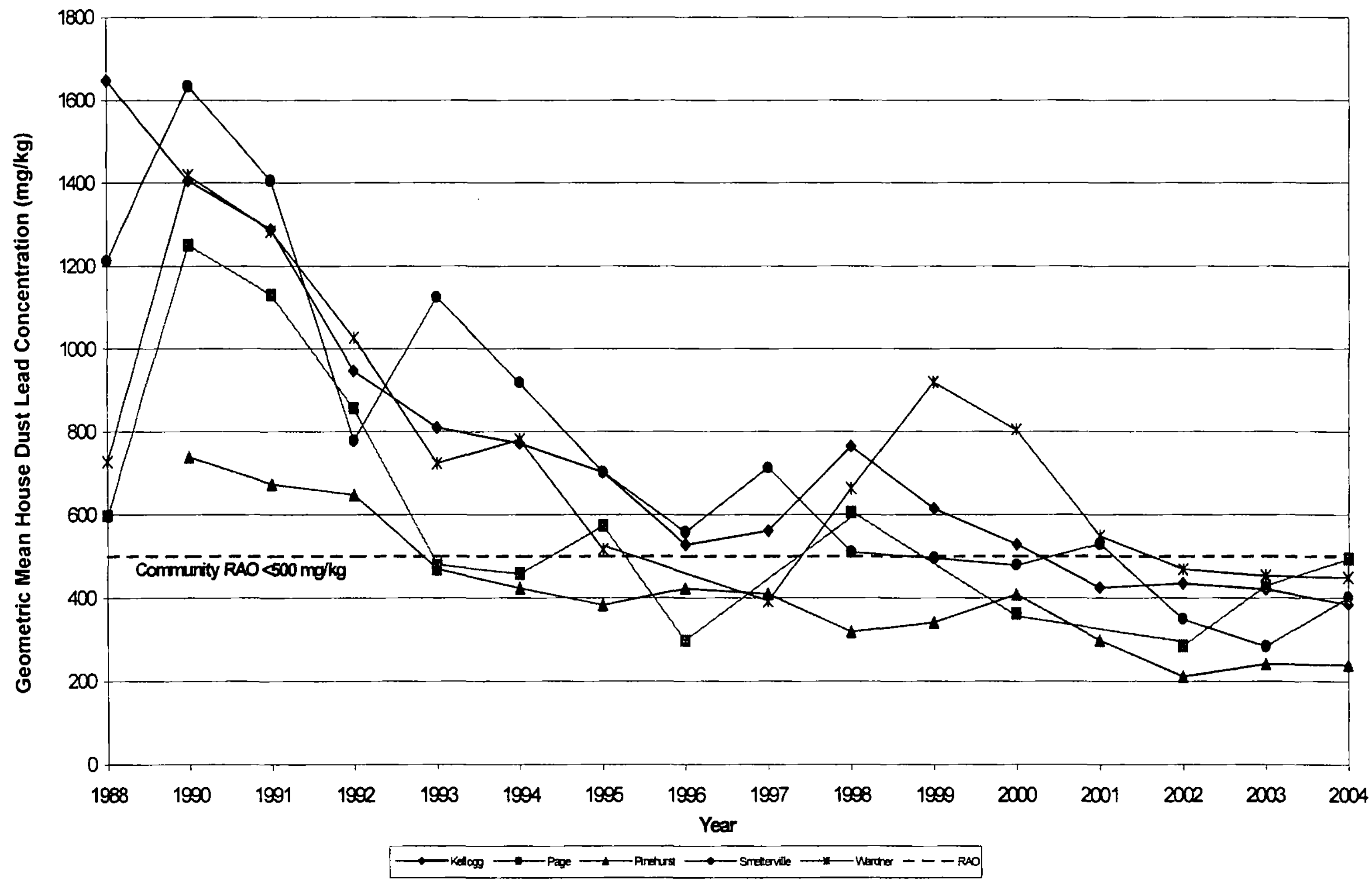


**Table 3-4. Observed Decrease in Geometric Mean Vacuum Dust Lead Concentrations by City**

| City | 1988 (mg/kg) | 2004 (mg/kg) | Percent Decrease | RAO (mg/kg) |
|---|---|---|---|---|
| Kellogg | 1648 | 387 | 77% | 500 |
| Page | 597 | 494 | 17% | 500 |
| Pinehurst | 739[a] | 239 | 68% | 500 |
| Smelterville | 1212 | 384 | 68% | 500 |
| Wardner | 728 | 376 | 48% | 500 |

[a] 1990 data used since this was the first year dust data were available for Pinehurst.

**Table 3-5. Homes ≥ 1,000 mg/kg Vacuum Dust Lead Concentration by City**

| City | 1988 | 2004 | RAO (mg/kg) |
|---|---|---|---|
| Kellogg | 77% (37) | 6% (5) | 0 |
| Page | 67% (4) | 0% (0) | 0 |
| Pinehurst | 23% (10)[a] | 4% (1) | 0 |
| Smelterville | 59% (10) | 11% (3) | 0 |
| Wardner | 33% (1) | 22% (2) | 0 |

[a] 1990 data used because 1988 data were not collected for Pinehurst.

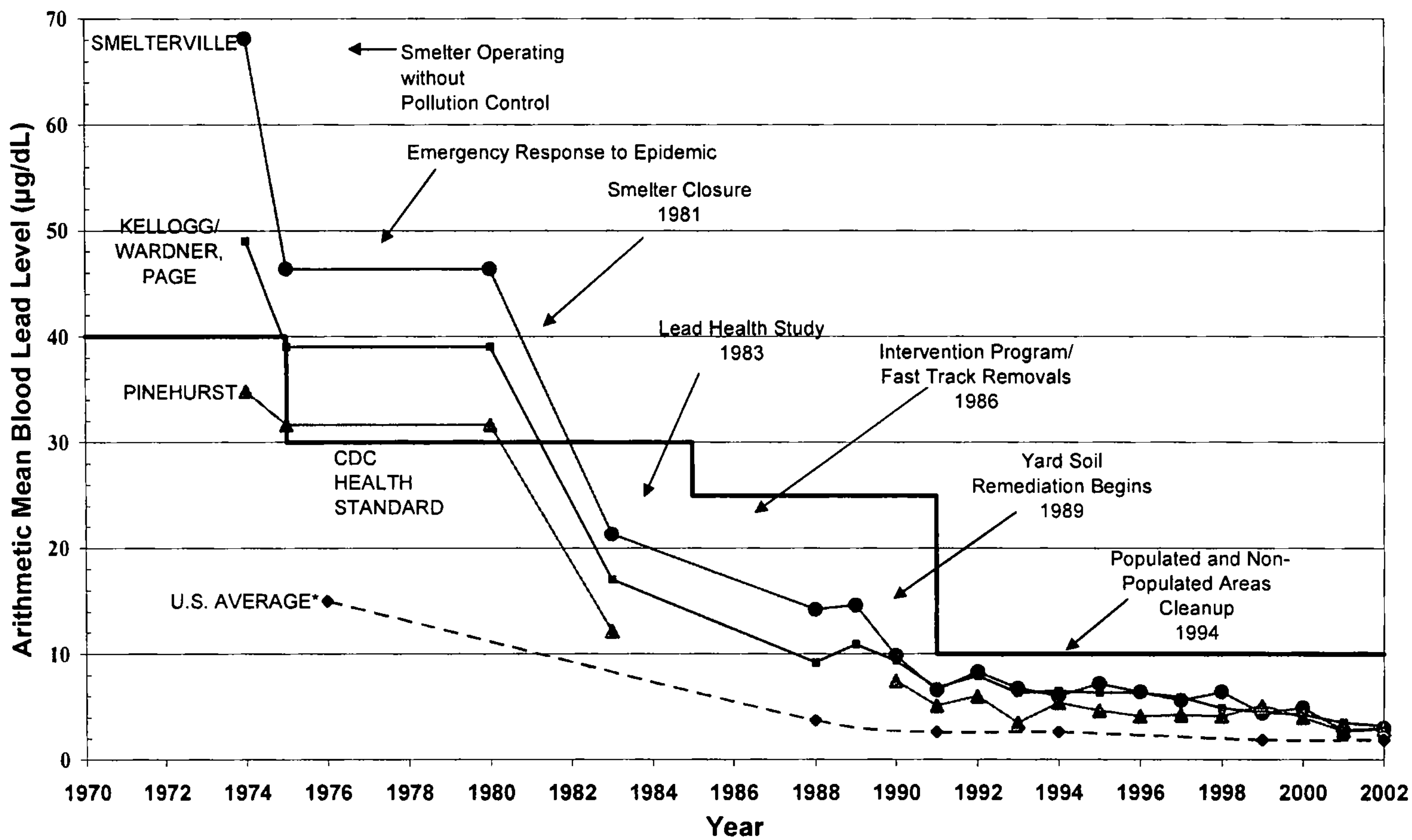
The incidence of blood lead levels greater than 10 μg/dL fell to 2 to 3 percent in the various communities (Figure 3-7 and Table 3-6). In addition, the percent of young children exceeding 15 μg/dL decreased to 0 to 1 percent in each community in 2002 (Figure 3-7 and Table 3-7). Therefore, it was determined in 2003 to curtail the door-to-door blood lead survey and repeat the first five-year review analyses incorporating LHIP data from 2000-2002. That review was accomplished in a report entitled the Human Health Remedial Evaluation (HHRE) (TerraGraphics, 2004).

The rationale for modifying the door-to-door blood lead survey included the following considerations:

1. The blood lead RAOs had been achieved and concentrations and percent of children above the 10 μg/dL criteria were consistent with typical levels in similar national socioeconomic strata.
2. The decline in blood lead levels corresponded with declining environmental media concentrations, and was consistent with the dose-response relationships underlying the cleanup strategy (see Tables 3-8 and 3-9).
3. The dose-response relationships have been evaluated with data from more than 15 years of blood lead survey results with participation from more than 50 percent of eligible children and community soil and dust annual sampling activities.

**Figure 3-6**

**Children's Blood Lead Levels by Year, 1974-2002**




*Ref.=(Mahaffey et al. 1982; Pirkle et al. 1994; Pirkle et al. 1998 ; Lofgren et al. 2000)

4. The Box residential remediation activities are nearing completion and the population most at-risk could alternatively be identified through other risk-based indices.
5. Community concern and participation has waned as blood lead levels continue to meet RAOs and community expectations.
6. Blood lead screening has been historically funded by the ATSDR, and the ATSDR reduced its funding for the Site. Funding for annual blood lead screening continues to be provided as a free service to community residents and is currently funded by the State of Idaho.

**Table 3-6. Children Exceeding the 10 µg/dL Blood Lead Level RAO by City**

| City | 1988 | 2002 | RAO |
|---|---|---|---|
| Kellogg[a] | 41% (70) | 2% (4) | <5% |
| Page | 58% (7) | 0% (0) | <5% |
| Pinehurst | 29% (31)[b] | 3% (3) | <5% |
| Smelterville | 72% (23) | 0% (0) | <5% |
| Wardner | 33% (5) | 0% (0) | <5% |

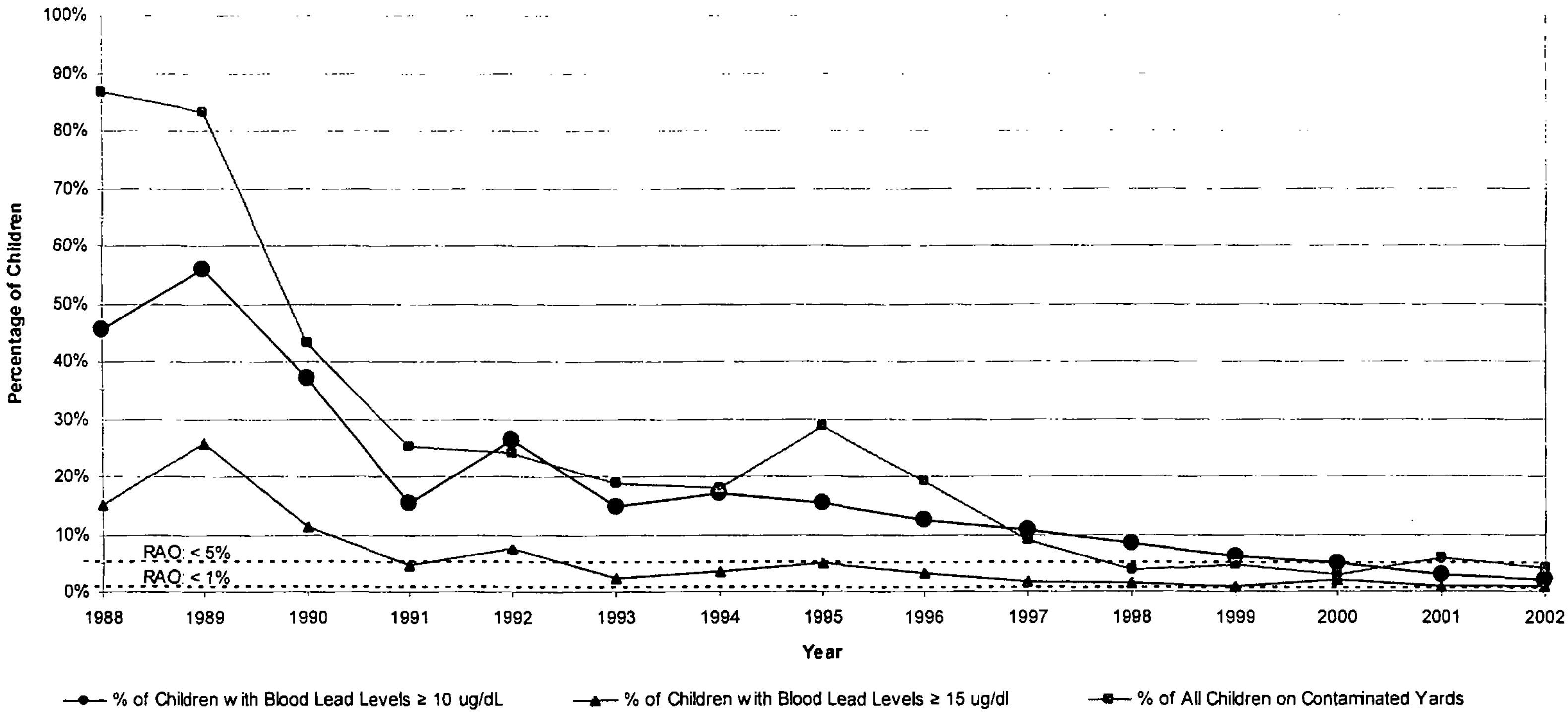
[a] Kellogg includes outlying communities such as Elizabeth Park, Montgomery Gulch, and Ross Ranch.
[b] 1990 data used because 1988 data were not collected for Pinehurst.

**Table 3-7. Children Exceeding the 15 µg/dL Blood Lead Level RAO by City**

| City | 1988 | 2002 | RAO |
|---|---|---|---|
| Kellogg[a] | 13% (22) | 1% (2) | <1% |
| Page | 17% (2) | 0% (0) | <1% |
| Pinehurst | 5% (5)[b] | 1% (1) | <1% |
| Smelterville | 31% (10) | 0% (0) | <1% |
| Wardner | 7% (1) | 0% (0) | <1% |

[a] Kellogg includes outlying communities such as Elizabeth Park, Montgomery Gulch, and Ross Ranch.
[b] 1990 data used because 1988 data were not collected for Pinehurst.

Figure 3-7
Percent of Children with Blood Lead Levels ≥ 10 μg/dL, Blood Levels ≥ 15 μg/dL and the Percent of All Children Tested Residing on Contaminated Yards, Operable Unit 1, 1988-2002



| Table 3-8. Yard Soil Lead Exposure by Year, 1974-2002b | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Number of Children | Concentration Range (mg/kg) [d] | | Mean Soil Lead Concentration (mg/kg) | | | |
| Year | City | | Minimum | Maximum | Arithmetic Mean | Standard Deviation | Geometric Mean | Standard Deviation |
| **1974** | Kellogg | 171 | 35 | 14000 | 3073 | 2199 | 2255 | 2.62 |
| | Page | 7 | 730 | 6800 | 3609 | 2477 | 2652 | 2.58 |
| | Pinehurst | 184 | 84 | 10400 | 1169 | 1434 | 768 | 2.41 |
| | Smelterville | 174 | 120 | 24600 | 7386 | 5157 | 5770 | 2.19 |
| | Wardner | 16 | 1000 | 23200 | 4863 | 5365 | 3405 | 2.29 |
| **1975** | Kellogg | 328 | 144 | 25800 | 3918 | 3652 | 2658 | 2.60 |
| | Pinehurst | 88 | 108 | 4020 | 676 | 617 | 497 | 2.18 |
| | Smelterville | 104 | 268 | 31800 | 5581 | 4721 | 3907 | 2.52 |
| | Wardner | 9 | 316 | 4800 | 2372 | 2311 | 1186 | 3.92 |
| **1983** | Smelterville | 43 | 83 | 17550 | 6231 | 3945 | 4188 | 3.60 |
| | Area 2[a] | 185 | 108 | 41200 | 3201 | 3722 | 2334 | 2.28 |
| | Pinehurst | 117 | 97 | 4375 | 814 | 842 | 534 | 2.54 |
| **1988** | Kellogg | 138 | 136 | 10400 | 3140 | 1796 | 2582 | 2.00 |
| | Page | 11 | 589 | 2720 | 1591 | 817 | 1365 | 1.86 |
| | Smelterville | 29 | 356 | 10700 | 2932 | 2180 | 2198 | 2.33 |
| | Wardner | 10 | 271 | 1930 | 1047 | 514 | 919 | 1.78 |
| **1989[c]** | Kellogg | 162 | 136 | 9230 | 2846 | 1600 | 2374 | 1.92 |
| | Page | 13 | 53 | 2720 | 1156 | 775 | 848 | 2.72 |
| | Smelterville | 34 | 356 | 8740 | 2975 | 2594 | 1858 | 2.94 |
| | Wardner | 11 | 271 | 2250 | 1304 | 632 | 1106 | 1.98 |
| **1990** | Kellogg | 154 | 100 | 10600 | 1741 | 1815 | 693 | 5.03 |
| | Page | 17 | 53 | 3480 | 953 | 1019 | 440 | 4.21 |
| | Pinehurst | 65 | 169 | 3060 | 561 | 474 | 436 | 2.00 |
| | Smelterville | 26 | 100 | 8170 | 1906 | 2190 | 719 | 5.21 |
| | Wardner | 14 | 100 | 13200 | 1675 | 3340 | 766 | 3.28 |
| **1991** | Kellogg | 176 | 100 | 7380 | 1088 | 1741 | 298 | 4.83 |
| | Page | 12 | 100 | 811 | 200 | 238 | 138 | 2.13 |
| | Pinehurst | 83 | 117 | 3060 | 597 | 597 | 434 | 2.13 |
| | Smelterville | 48 | 100 | 10700 | 1235 | 2063 | 319 | 5.16 |
| | Wardner | 9 | 100 | 100 | 100 | 0 | 100 | 1.00 |
| **1992** | Kellogg | 206 | 100 | 6930 | 1068 | 1639 | 302 | 4.80 |
| | Page | 11 | 100 | 1190 | 353 | 452 | 187 | 2.96 |
| | Pinehurst | 96 | 79 | 3060 | 571 | 530 | 419 | 2.15 |
| | Smelterville | 55 | 100 | 8800 | 1254 | 2329 | 311 | 4.99 |
| | Wardner | 15 | 100 | 100 | 100 | 0 | 100 | 1.00 |
| **1993** | Kellogg | 214 | 100 | 10600 | 772 | 1531 | 223 | 3.96 |
| | Page | 14 | 100 | 1670 | 493 | 570 | 241 | 3.43 |
| | Pinehurst | 109 | 79 | 3060 | 525 | 575 | 360 | 2.31 |
| | Smelterville | 60 | 100 | 7650 | 1639 | 2644 | 339 | 5.88 |
| | Wardner | 14 | 100 | 1850 | 409 | 623 | 179 | 3.20 |
| **1994** | Kellogg | 213 | 100 | 13400 | 952 | 1901 | 256 | 4.37 |
| | Page | 11 | 100 | 1670 | 463 | 512 | 260 | 3.12 |
| | Pinehurst | 93 | 79 | 2860 | 407 | 412 | 282 | 2.32 |
| | Smelterville | 48 | 100 | 8740 | 1074 | 2374 | 202 | 4.56 |
| | Wardner | 14 | 100 | 2568 | 453 | 801 | 179 | 3.28 |

**Table 3-8. Yard Soil Lead Exposure by Year, 1974-2002b**

| Year | City | Number of Children | Concentration Range (mg/kg)[d] | | Mean Soil Lead Concentration (mg/kg) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Minimum | Maximum | Arithmetic Mean | Standard Deviation | Geometric Mean | Standard Deviation |
| **1995** | Kellogg | 231 | 100 | 10500 | 1663 | 2486 | 435 | 5.60 |
| | Page | 10 | 100 | 664 | 309 | 274 | 207 | 2.57 |
| | Pinehurst | 74 | 100 | 2670 | 373 | 483 | 234 | 2.44 |
| | Smelterville | 38 | 100 | 7370 | 873 | 1932 | 184 | 4.19 |
| | Wardner | 5 | 100 | 2568 | 1142 | 1051 | 561 | 4.91 |
| **1996** | Kellogg | 195 | 100 | 6880 | 855 | 1487 | 245 | 4.28 |
| | Page | 11 | 100 | 664 | 301 | 278 | 198 | 2.57 |
| | Pinehurst | 64 | 37 | 1380 | 377 | 360 | 234 | 2.72 |
| | Smelterville | 40 | 100 | 3900 | 195 | 601 | 110 | 1.78 |
| | Wardner | 6 | 100 | 3180 | 1949 | 1458 | 935 | 5.66 |
| **1997** | Kellogg | 178 | 100 | 4770 | 472 | 942 | 176 | 3.12 |
| | Page | 7 | 100 | 664 | 341 | 236 | 255 | 2.42 |
| | Pinehurst | 74 | 37 | 2860 | 470 | 561 | 305 | 2.50 |
| | Smelterville | 31 | 100 | 766 | 176 | 165 | 137 | 1.87 |
| | Wardner | 11 | 100 | 100 | 100 | 0 | 100 | 1.00 |
| **1998** | Kellogg | 205 | 100 | 4957 | 322 | 827 | 128 | 2.46 |
| | Page | 27 | 100 | 1322 | 412 | 355 | 267 | 2.70 |
| | Pinehurst | 73 | 37 | 1850 | 368 | 280 | 277 | 2.23 |
| | Smelterville | 42 | 100 | 616 | 169 | 150 | 133 | 1.83 |
| | Wardner | 12 | 100 | 100 | 100 | 0 | 100 | 1.00 |
| **1999** | Kellogg | 198 | 100 | 5363 | 265 | 691 | 129 | 2.22 |
| | Page | 8 | 100 | 651 | 336 | 258 | 238 | 2.54 |
| | Pinehurst | 101 | 100 | 1820 | 437 | 351 | 333 | 2.12 |
| | Smelterville | 47 | 100 | 588 | 209 | 163 | 162 | 1.97 |
| | Wardner | 9 | 100 | 727 | 170 | 209 | 125 | 1.94 |
| **2000** | Kellogg | 166 | 100 | 5320 | 218 | 590 | 121 | 1.98 |
| | Page | 8 | 100 | 651 | 336 | 258 | 238 | 2.54 |
| | Pinehurst | 91 | 66 | 1820 | 443 | 342 | 334 | 2.22 |
| | Smelterville | 43 | 100 | 766 | 183 | 173 | 139 | 1.93 |
| | Wardner | 7 | 100 | 727 | 190 | 237 | 133 | 2.12 |
| **2001** | Kellogg | 180 | 100 | 3889 | 309 | 730 | 135 | 2.45 |
| | Page | 7 | 100 | 425 | 193 | 159 | 151 | 2.03 |
| | Pinehurst | 97 | 34 | 1540 | 325 | 292 | 228 | 2.35 |
| | Smelterville | 23 | 100 | 766 | 174 | 175 | 133 | 1.89 |
| | Wardner | 9 | 100 | 727 | 170 | 209 | 125 | 1.94 |
| **2002** | Kellogg | 192 | 100 | 5363 | 247 | 619 | 127 | 2.16 |
| | Page | 8 | 100 | 1160 | 314 | 372 | 195 | 2.65 |
| | Pinehurst | 106 | 31 | 874 | 313 | 237 | 230 | 2.28 |
| | Smelterville | 44 | 100 | 467 | 125 | 94 | 111 | 1.48 |
| | Wardner | 5 | 100 | 727 | 225 | 280 | 149 | 2.43 |

[a] Kellogg, Wardner, and Page combined.
[b] Only represents data from homes where children's blood samples were obtained, which is a subset of the overall number of yard soil samples collected in OU1.
[c] 1989 exposures are projected from 1988 samples of the same homes.
[d] Yards are assigned a lead concentration of 100 mg/kg once remediated.

| Table 3-9. House Dust Lead Exposure by Year, 1974-2002b | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Number of Children | Concentration Range (mg/kg) | | Mean House Dust Lead Concentration (mg/kg) | | | |
| Year | City | | Minimum | Maximum | Arithmetic Mean | Standard Deviation | Geometric Mean | Standard Deviation |
| 1974 | Kellogg | 68 | 1945 | 24500 | 8316 | 5722.5 | 6765 | 1.91 |
| | Page | 0 | - | - | - | - | - | - |
| | Pinehurst | 49 | 940 | 4790 | 2317 | 1097.9 | 2087 | 1.59 |
| | Smelterville | 86 | 1940 | 26700 | 11997 | 5277.5 | 10789 | 1.65 |
| | Wardner | 11 | 2060 | 6800 | 5318 | 1547.3 | 5033 | 1.47 |
| 1975 | Kellogg | 243 | 325 | 9850 | 5094 | 2038.6 | 4552 | 1.73 |
| | Pinehurst | 65 | 465 | 6000 | 2042 | 1186.3 | 1707 | 1.87 |
| | Smelterville | 60 | 200 | 9350 | 4736 | 2852.2 | 3492 | 2.54 |
| | Wardner | 5 | 2550 | 3350 | 2710 | 357.8 | 2693 | 1.13 |
| 1983 | Smelterville | 42 | 322 | 18400 | 4734 | 4207.0 | 2922 | 3.07 |
| | Area 2[a] | 194 | 53 | 20700 | 3621 | 3520.1 | 2585 | 2.35 |
| | Pinehurst | 121 | 151 | 2915 | 590 | 459.0 | 471 | 1.92 |
| 1988 | Kellogg | 58 | 94 | 52700 | 3336 | 7790.4 | 1516 | 2.85 |
| | Page | 3 | 69 | 1160 | 746 | 591.4 | 432 | 4.91 |
| | Smelterville | 23 | 209 | 4640 | 1746 | 1376.7 | 1237 | 2.51 |
| | Wardner | 4 | 427 | 1480 | 736 | 503.5 | 637 | 1.80 |
| 1989[c] | Kellogg | 47 | 228 | 52700 | 4568 | 9721.2 | 1652 | 3.31 |
| | Page | 5 | 69 | 1160 | 794 | 496.4 | 547 | 3.38 |
| | Smelterville | 14 | 209 | 4640 | 1628 | 1352.9 | 1193 | 2.42 |
| | Wardner | 2 | -- | -- | -- | -- | -- | -- |
| 1990 | Kellogg | 89 | 117 | 6230 | 1610 | 1164.9 | 1245 | 2.22 |
| | Page | 5 | 898 | 2070 | 1221 | 487.3 | 1159 | 1.41 |
| | Pinehurst | 57 | 119 | 7990 | 1140 | 1491.2 | 747 | 2.37 |
| | Smelterville | 15 | 777 | 4210 | 2117 | 1128.8 | 1849 | 1.72 |
| | Wardner | 5 | 691 | 2220 | 1231 | 749.8 | 1064 | 1.81 |
| 1991 | Kellogg | 75 | 274 | 3960 | 1460 | 761.0 | 1283 | 1.69 |
| | Page | 5 | 545 | 1680 | 1285 | 432.6 | 1202 | 1.57 |
| | Pinehurst | 59 | 65 | 13500 | 912 | 1732.0 | 603 | 2.16 |
| | Smelterville | 27 | 790 | 2700 | 1468 | 496.0 | 1393 | 1.39 |
| | Wardner | 4 | 307 | 964 | 784 | 319.5 | 712 | 1.75 |
| 1992 | Kellogg | 125 | 104 | 5530 | 1183 | 838.8 | 928 | 2.08 |
| | Page | 5 | 473 | 1500 | 792 | 420.5 | 719 | 1.61 |
| | Pinehurst | 78 | 165 | 3470 | 769 | 645.0 | 601 | 1.96 |
| | Smelterville | 26 | 140 | 3790 | 1175 | 1033.3 | 881 | 2.15 |
| | Wardner | 9 | 322 | 5240 | 1458 | 1508.9 | 997 | 2.51 |
| 1993 | Kellogg | 115 | 111 | 3210 | 966 | 563.7 | 806 | 1.91 |
| | Page | 6 | 139 | 794 | 550 | 227.1 | 486 | 1.89 |
| | Pinehurst | 55 | 111 | 3460 | 707 | 763.7 | 490 | 2.29 |
| | Smelterville | 26 | 201 | 3350 | 1307 | 818.6 | 1086 | 1.94 |
| | Wardner | 8 | 382 | 1290 | 766 | 353.4 | 695 | 1.61 |
| 1994 | Kellogg | 106 | 88 | 3770 | 835 | 551.7 | 660 | 2.13 |
| | Page | 7 | 90 | 1340 | 619 | 485.2 | 450 | 2.55 |
| | Pinehurst | 48 | 88 | 1490 | 491 | 283.7 | 420 | 1.82 |
| | Smelterville | 35 | 228 | 3060 | 1146 | 785.9 | 872 | 2.21 |

**Table 3-9. House Dust Lead Exposure by Year, 1974-2002b**

| Year | City | Number of Children | Concentration Range (mg/kg) | | Mean House Dust Lead Concentration (mg/kg) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Minimum | Maximum | Arithmetic Mean | Standard Deviation | Geometric Mean | Standard Deviation |
| | Wardner | 13 | 211 | 2270 | 1025 | 764.3 | 764 | 2.31 |
| 1995 | Kellogg | 98 | 62 | 4400 | 906 | 809 | 679 | 2.15 |
| | Page | 3 | 239 | 1430 | 791 | 600 | 622 | 2.46 |
| | Pinehurst | 38 | 22 | 1720 | 458 | 381 | 299 | 3.02 |
| | Smelterville | 20 | 297 | 3470 | 1020 | 1087 | 703 | 2.24 |
| | Wardner | 4 | 245 | 601 | 408 | 190 | 374 | 1.63 |
| 1996 | Kellogg | 108 | 85 | 2300 | 684 | 399 | 577 | 1.86 |
| | Page | 3 | 140 | 630 | 303 | 283 | 231 | 2.38 |
| | Pinehurst | 38 | 100 | 2100 | 519 | 459 | 403 | 2.00 |
| | Smelterville | 12 | 99 | 11300 | 2299 | 4213 | 667 | 4.69 |
| | Wardner | 3 | 130 | 890 | 637 | 439 | 469 | 3.04 |
| 1997 | Kellogg | 59 | 43 | 6800 | 1047 | 1445 | 631 | 2.63 |
| | Page | 2 | -- | -- | -- | -- | -- | -- |
| | Pinehurst | 19 | 140 | 15000 | 1155 | 3363 | 397 | 2.83 |
| | Smelterville | 15 | 110 | 1070 | 453 | 323 | 354 | 2.09 |
| | Wardner | 6 | 220 | 1100 | 668 | 473 | 509 | 2.33 |
| 1998 | Kellogg | 84 | 140 | 4000 | 856 | 764 | 654 | 2.04 |
| | Page | 4 | 550 | 1500 | 848 | 441 | 779 | 1.57 |
| | Pinehurst | 36 | 71 | 2000 | 399 | 367 | 302 | 2.08 |
| | Smelterville | 26 | 340 | 1100 | 621 | 201 | 595 | 1.34 |
| | Wardner | 10 | 270 | 6000 | 1589 | 2335 | 738 | 3.27 |
| 1999 | Kellogg | 93 | 199 | 15300 | 1134 | 2638 | 618 | 2.26 |
| | Page | 3 | 151 | 258 | 222 | 62 | 216 | 1.36 |
| | Pinehurst | 64 | 45 | 4010 | 435 | 492 | 337 | 1.98 |
| | Smelterville | 15 | 259 | 2150 | 596 | 527 | 462 | 1.98 |
| | Wardner | 2 | -- | -- | -- | -- | -- | -- |
| 2000 | Kellogg | 70 | 49 | 11200 | 860 | 1855 | 459 | 2.53 |
| | Page | 3 | 86 | 220 | 131 | 77 | 118 | 1.72 |
| | Pinehurst | 39 | 150 | 2300 | 599 | 599 | 421 | 2.22 |
| | Smelterville | 24 | 150 | 1100 | 433 | 202 | 397 | 1.51 |
| | Wardner | 1 | -- | -- | -- | -- | -- | -- |
| 2001 | Kellogg | 71 | 64 | 1900 | 449 | 335 | 368 | 1.87 |
| | Page | 2 | -- | -- | -- | -- | -- | -- |
| | Pinehurst | 35 | 57 | 1200 | 295 | 272 | 224 | 2.03 |
| | Smelterville | 5 | 220 | 420 | 308 | 82 | 299 | 1.31 |
| | Wardner | 3 | 180 | 960 | 670 | 427 | 532 | 2.56 |
| 2002 | Kellogg | 65 | 32 | 3500 | 548 | 636 | 362 | 2.52 |
| | Page | 3 | 250 | 270 | 263 | 12 | 263 | 1.05 |
| | Pinehurst | 31 | 51 | 1200 | 204 | 213 | 157 | 1.94 |
| | Smelterville | 17 | 54 | 2400 | 448 | 536 | 278 | 2.87 |
| | Wardner | 2 | -- | -- | -- | -- | -- | -- |

-- When the number of observations is less than 2, then data are not shown for confidentiality purposes.
[a] Kellogg, Wardner, and Page combined.
[b] Vacuum bags collected only from homes where children's blood samples were obtained.
[c] 1989 exposures are projected from 1988 samples of the same homes.

It is difficult to quantify the effect of a specific action in reducing blood lead levels in OU1. However, estimates have been based on observed declines in lead intakes from soil and house dust sources as well as comparisons between concurrent site-specific and national declines in blood lead levels (Pirkle et al., 1998; Meyer et al., 2003; von Lindern et al., 2003).

In the National Academies' National Research Council (NRC) pre-publication report, entitled *Superfund and Mining Megasites - Lessons from the Coeur d'Alene River* Basin (NRC, 2005), the NRC concludes that USEPA's "analyses do provide support for the conclusions that lead associated with mining wastes is a significant source of increased blood lead levels, although lead paint is also a significant source for children likely to be exposed to that source" (NRC, 2005, p. 159).

Lead is ubiquitous in the Silver Valley environment and is presented to children in a variety of media and pathways. The overall OU1 risk management program has been an integrated effort to minimize lead exposure through several mechanisms. The blood lead reductions that have been achieved since smelter closure are the aggregate effect of several activities, including:

- The LHIP that promotes awareness among area parents and children (1985 to present) through education, biological monitoring, and follow-up counseling;
- The Fast-Track Common-Use Areas (CUA) Cleanup program that removed contaminated soils from public parks, playgrounds, and roadsides (1986);
- Interim Fugitive Dust Control efforts to mitigate outdoor sources of dust lead particulate (1987 and 1990-93);
- The High-Risk Yard Cleanup program that replaced contaminated soils in home yards of young children throughout OU1 (1989-present);
- The Geographic Areas Cleanup program that replaced contaminated soils within neighborhoods (1995-present);
- The cleanup activities conducted under the non-populated areas ROD;
- The ICP's management of installed barriers; and
- General declines in consumer lead exposures due to national reductions of lead in gasoline, food, and paint.

The significant reductions in blood lead levels occurred in increments associated with particular cleanup activities. Since the first five-year review for OU1 (USEPA, 2000), the pace of residential cleanup has been maintained and is almost completed, and the percent of children in a high-risk situation is less than 5 percent. In addition, other remedial actions have been completed in the Box such as the completion of large-scale hillside revegetation activities, capping of the Smelterville Flats area in 2000, and closure of the CIA with a geomembrane cover and clean soil cap in 2001. These projects have effectively eliminated major sources of fugitive dust to the populated areas. With these actions and the completion of many Phase I remedial actions within OU2, a notable decrease in house dust lead levels has been observed. For example, from 2001 to 2002, geometric mean house dust exposures decreased an additional 35 percent from 425 mg/kg to 279 mg/kg (see Table 3-9). This resulted in a decline in the estimated geometric mean soil/dust lead intake from 34 μg/day to 26 μg/day, which was accompanied by another 33 percent reduction in mean blood lead levels from 3.5 μg/dL to 2.6 μg/dL (Figure 3-8). During this same time, the prevalence of blood lead levels exceeding the 10 μg/dL criteria fell to 2 percent (TerraGraphics, 2004).

#### 3.2.1.4 Lead Health Intervention Program

All blood lead level information for OU1 was collected under the auspices of the Lead Health Intervention Program (LHIP). The LHIP includes activities designed to intervene in lead absorption pathways through biological monitoring, follow-up, parental awareness and counseling, education, and behavior modification. The LHIP has been conducted by the local PHD and funded primarily through federal grants to the Idaho Department of Health and Welfare (IDHW), Division of Health.

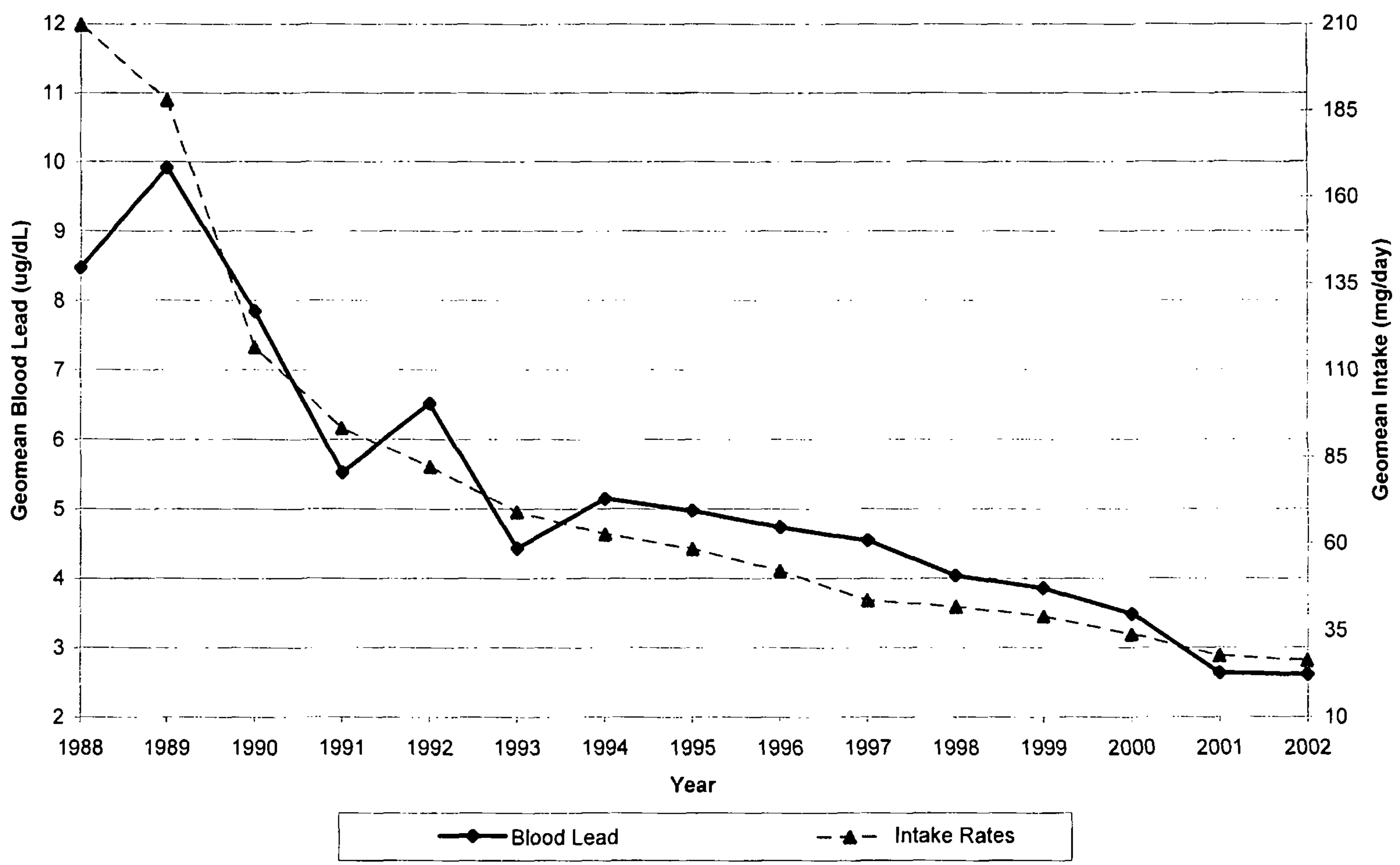
Communities in OU1 were surveyed through door-to-door screening each year from 1985 to 2002 in July through August. Basic data were collected, residents were solicited to have their children's blood lead levels tested, and each eligible child that participated was paid $20. In the summer of 2003, the LHIP surveillance protocol was modified in response to consecutive years of low blood lead levels to eliminate the door-to-door survey and incentive payments in favor of a voluntary testing program and surveillance under the State Medicaid program.

Each year, a public health nurse visits area public schools, Headstart Programs, and a privately run academy. Presentations are conducted for students in kindergarten through the third grade. The presentations cover the students' role in identification and management of exposure pathways that may affect them or their siblings (Yiin et al., 2000) A public health nurse and a senior environmental health specialist are available for consultations regarding sources of exposure to lead and the management of exposure pathways. A variety of locally developed fact sheets, brochures, coloring books, and two videos are available regarding lead and children and exposure to lead during pregnancy. Lead health information has been integrated into existing programs offered by the local health district. A physician awareness program has been developed to keep local physicians apprised of program activities and the services that are available.

From 1999 to 2002, 320 to 370 children provided blood samples each year. This is compared to an average of about 380 children in the previous four years. Records obtained from the local school district indicate that K-5 enrollments were down about 6 percent for the same period indicating that the LHIP participation rate remained near the same percentage of the population from 1999 to 2002. This suggests that an estimated 685 children, age 9 months to 9 years, live in the Box in the most recent years. Approximately 54 percent of these children were tested and 2 percent of those tested had elevated blood lead levels. Follow-up visits were conducted at the homes of these children and the results indicated that their excess absorption was likely associated with exposures outside of the home environment.

Follow-up services were provided to the parents of all children exhibiting an elevated blood lead level. Follow-up consisted of a home visit by a public health nurse who provided parents counseling and written information on how to identify sources of lead and reduce their child's exposure. A home survey and questionnaire was completed and educational materials were provided to the parents, as well as nutritional counseling. Multi-vitamins were also provided until 2002. A follow-up blood screen was offered 3 to 4 months later,

**Figure 3-8**
**OU1 Lead Intake Rates and Geometric Mean Blood Lead Levels**



and it was recommended that the child's blood lead information be shared with the family physician and that the child participate in the following Summer Screening Program.

The activities and effectiveness of the LHIP efforts were analyzed and evaluated in the first five-year review through 1998. Since that time, home follow-up has been provided to the majority of children exhibiting blood lead levels above 10 µg/dL. There continue to be a variety of factors that have contributed to elevated blood lead levels in OU1, including significant exposures to contaminated play areas, hillsides, or recreational sites; pica-like tendencies; living in a home with chipping lead paint; or living in a home with dust lead levels greater than 1,000 mg/kg. A more detailed discussion of the follow-up results can be found in the HHRE (TerraGraphics, 2004).

### 3.2.1.5 Institutional Controls Program

The Box ICP was adopted as a final rule in April 1995 for OU1 and OU2. The OU2 ICP is discussed in Section 4.2.1 of this report. Issues related to the Box ICP also are discussed in an IDEQ technical memorandum entitled *2005 Five-Year Review of Institutional Controls Program Box Issues* (TerraGraphics, 2005c) and the Upstream Mining Group's report entitled *Bunker Hill Superfund Site Second 5-Year Review Report* (UMG, 2005b).

The ICP was established to ensure that barriers remain protective, are adequately maintained, and are appropriately installed in new developments and re-development activities, as well as to assure clean materials and appropriate disposal options for the local communities. The importance of an ICP was noted in the NRC's pre-publication report, which recommended long-term support of institutional control programs to avoid undue human health risks from recontamination (NRC, 2005, p. 159).

The ICP is adopted as a local ordinance through the PHD. It is designed to ensure barrier integrity and proper construction practices throughout the Box while facilitating community development and commerce. The ICP regulates construction and use changes on all properties where protective barriers and caps have been installed. The program provides a number of services free to local residents, including education, sampling assistance, clean soils for small projects (less than one cubic yard of material), collection of soil removed in small projects, and a permanent disposal site for contaminated soils generated in the Box. The ICP also regulates and provides information for interior construction and renovation projects that involve ceiling and/or insulation removal, as well as dirt basements and crawl spaces. The ICP's main enforcement mechanisms are linked to existing local building departments and land use planning activities and include:

- Contaminant management rules,
- Barrier design/permitting criteria,
- Ordinances requiring PHD sign-off on building permits,
- Ordinance amendments to comprehensive plans and zoning regulations,
- Model subdivision ordinances,
- Stormwater management requirements, and
- Road standards and design criteria.

The ICP is adopted under State law and violation of the rule is a misdemeanor punishable by a $300 per day fine and up to 6 months in jail. To date, the PHD has not had to use its enforcement authority to gain compliance.

The ICP was adopted after several years of public input through meetings with the Bunker Hill Superfund Site Task Force, local citizens, and government officials. The outcome of these meetings was an ICP established to ensure the long-term integrity of clean material barriers and to accommodate future development of the area. The Task Force, appointed by local governments, and area citizens agreed to this strategy with the following provisions:

- Institutional controls minimize inconvenience, cost, and loss of land use options to local residents;
- Institutional controls utilize, to the maximum extent practicable, existing control mechanisms and local agencies; and
- Institutional controls are self-sustaining and impose no additional costs on local governments, residents, or property owners.

Federal and State representatives endorsed this concept and meetings continued to further refine the needs and mechanisms required to implement the program. The result was a unique ICP that is more comprehensive than institutional controls implemented at many other Superfund sites. The ICP is a locally based program that is similar to a building permit program. The ICP includes records maintenance, permitting, surveillance, inspections, and local construction regulations developed and implemented in conjunction with local zoning, building, or planning commissions. The ICP implements a number of programs such as:

- Issuing excavation permits at no charge;
- Supplying clean soil for small projects (less than one cubic yard of material);
- Collecting and disposing of contaminated soil from small projects;
- Supplying residents with a free disposal location for contaminated soil;
- Regulating contaminant migration from one property to another;
- Training and licensing contractors, government entities, and local utilities;
- Providing disclosure information for real estate transactions; and
- Providing education and safety materials for indoor construction work that may result in exposures to lead-contaminated dust in attics or dirt crawl spaces.

The ICP also offers a vacuum cleaner loan program, which is funded by the PRPs, where high efficiency particulate air filter (HEPA) vacuum cleaners are loaned to local residents. The HEPA vacuum loan program has been a valuable part of the ICP for interior projects and also to help keep dust levels down for those homes with no vacuum cleaners. The average number of checkouts per month reported in the first five-year review was 24. The average number of checkouts per month between 1999 and 2004 is 25, indicating that the resource is still being used by the community.

The first five-year review recommended additional advertisement of the vacuum cleaner loan program and creation of home cleaning informational pamphlets to ensure that local families who do not own vacuums are aware of the service. Since the first five-year review, the PHD has acquired new informational pamphlets including one entitled "A Clean Home is a Healthy Home." These pamphlets and other health information materials are made available to all PHD clients. In addition, the PHD staff regularly visit local consumer outlets, such as grocery stores and laundromats, to post flyers about the program. New families are using the service and use has remained stable over the years despite substantial declines in children's blood lead levels and soil and house dust lead concentrations (Cobb, 2005).

In OU1, the ICP issued 971 permits since the last five-year review (Table 3-10). In addition, for both OU1 and OU2, the ICP has issued 481 licenses to contractors, government entities, and local utilities from 2000 to the present. Through the PHD, the ICP is also available to assist with local land transactions. The ICP provides and maintains a record of environmental data and property remediation. This information is available to prospective purchasers, homeowners, and realtors. In OU1 and OU2, 201 disclosures were provided in 2004, compared to 130 in 2000.

**Table 3-10. OU1 ICP Permits Issued (2000 - 2004)**

| Permit Type | Permits Issued | | | | | |
|---|---|---|---|---|---|---|
| | 2000 | 2001 | 2002 | 2003 | 2004 | Total |
| Large Projects, Populated | 138 | 127 | 100 | 101 | 156 | 622 |
| Interiors, Populated | 14 | 14 | 23 | 18 | 6 | 75 |
| Subdivision/PUDs, Populated | 0 | 0 | 0 | 0 | 0 | 0 |
| Demolition, Populated | 4 | 3 | 1 | 7 | 8 | 23 |
| Records of Compliance, Populated | 29 | 41 | 66 | 53 | 62 | 251 |
| Total | 185 | 185 | 190 | 179 | 232 | 971 |

The State of Idaho and the PRPs share general ICP costs that apply to activities in both OU1 and OU2. The PRPs fund 84 percent of the general costs for OU1 and the State pays 16 percent for OU2. The costs for operating the ICP during the last 5 years, including the general costs, have been $794,764, with annual expenditures averaging about $159,000. The funding for the OU1 program has been provided by the PRPs, who have missed two payments over the last 5 years. During those times, the State of Idaho had to fund the ICP to fill the gap. The PRPs are now current with their funding commitment to the ICP. The total cost of the OU1 ICP program for the last 5 years has been $665,317 with annual expenditures averaging $133,063.

#### 3.2.1.6 Disposal/ICP Repository

Long-term disposal is necessary to meet the needs of local residents, contractors, utilities, and local government, while protecting the remedial actions implemented pursuant to the RODs. Since 1991, the Page Ponds soil repository has been used as the primary soil repository for the ICP. In addition to the ICP, the Page repository is used by the PRPs for disposal of soil generated from the residential yard remediation program.

Page repository has offered several advantages for low-cost disposal. All contaminated materials disposed of at the Page site remain within the Box area of contamination, which has resulted in capping existing tailings. Previously, these tailings had been a continual source of wind-blown dust. Development of Page as a disposal site also eliminated use of the tailings piles as recreational areas for riding all-terrain vehicles. At closure, the repository area will be graded to control runoff and re-vegetated to eliminate dust re-entrainment (MFG, 2000).

The availability of a disposal site that is open 24 hours per day, 7 days a week has been highly valuable to local residents, utilities, contractors, and local government. ICP staff provide oversight of disposal activities on an intermittent basis and coordinate movement of materials from large projects as needed. The site operates on the honor system amongst users and few problems have been encountered regarding abuse. Entities served by the ICP (i.e., local residents, utilities, contractors, and local government) recognize the importance of a centrally located and user-friendly disposal site and have cooperated with the ICP to ensure that it remains available. Those who do not adhere to operating parameters are contacted and counseled on appropriate use, and legal action to ensure compliance remains an available option. A decontamination station is not available at the Page site for any users. The need for a decontamination station was identified in the first five-year review (see Section 4.3.5 of this document).

Long-term disposal capacity at Page is a concern, and a new or expanded facility will be required to accommodate future needs. Contaminated materials are expected to be generated from installation and reconstruction of old and failing infrastructure, as well as continued economic development in OU1. The ability to dispose of contaminated soil, construction materials, and used residential carpets is an essential baseline requirement for operating a successful ICP. The present value costs of developing a new ICP disposal facility has been estimated at $11 million to $24 million.

Several factors will need to be considered when evaluating long-term disposal needs for OU1, including assessment of existing and new waste streams from community construction projects, material handling and segregation, vehicle decontamination procedures, site access, and site management.

#### *Snow Disposal*

The first five-year review noted that a snow disposal area was needed for OU1. Materials from both remediated and unremediated properties in the community are picked up as snow is removed from roadways, parking lots, and other areas that are required to be kept open during the winter. A number of areas have been used for snow disposal since 1989. These areas are sampled in the spring and contaminated materials that accumulate as a result of snowmelt are cleaned up. As soil remediation is completed in the residential areas, it is unclear if a specific snow disposal area will continue to be needed. Therefore, the need for a centrally located, easily accessible snow disposal area will be further evaluated in the next five-year review.

### 3.2.1.7 Infrastructure

Sustaining protective barriers is critical to the long-term success of the remedy, and relies on the successful implementation of the ICP and the condition and effectiveness of the supporting infrastructure. The first five-year review noted that new infrastructure and regular maintenance of existing drainage infrastructure by the state, local entities, business owners, and residents is needed to ensure remedy success.

Infrastructure plays several major roles in the remedial strategy. For example, roads, buildings, and parking lots may serve as barriers to subsurface contaminants; adequate and appropriately functioning infrastructure (i.e., stormwater conveyance, irrigation and street watering, and hydrologic management facilities) is necessary to control erosion and recontamination due to flooding; and adequate infrastructure is critical to economic redevelopment that is, in turn, essential to break the link between poverty and childhood lead poisoning (TerraGraphics, 2004 and 2005d).

Figures 3-9a, b, and c illustrate the degree to which the OU1 remedy relies on protective barriers installed over subsurface contamination, which require long-term maintenance. Some of the most complex barriers are in OU1, where several hundred acres of soil barriers have been installed and much of the contamination is overlain by community infrastructure. Infrastructure issues also are discussed in the IDEQ technical memorandum entitled *The Role of Community Infrastructure in the Cleanup* (TerraGraphics, 2005d).

The local communities have expressed concern about their ability to upgrade and maintain existing infrastructure and the associated operations and maintenance obligations needed to ensure long-term protectiveness of the remedy. As a result, funding and other resources needed to meet these obligations are issues for the long-term effectiveness of the remedy. Traditional infrastructure funding sources require relatively high local match requirements and the IDEQ completed an ability-to-pay analysis for the local communities. The analysis concluded that, in general, the communities do not have the resources to meet federal infrastructure grant requirements (TerraGraphics, 2005e).

Due to the significance of infrastructure in long-term remedy success, the USEPA and the State of Idaho will continue to work with the local communities and other federal and local agencies to clarify the infrastructure issues and develop viable solutions. The status of infrastructure improvements will be monitored and reviewed in the next five-year review.

## 3.2.2 Technical Assessment

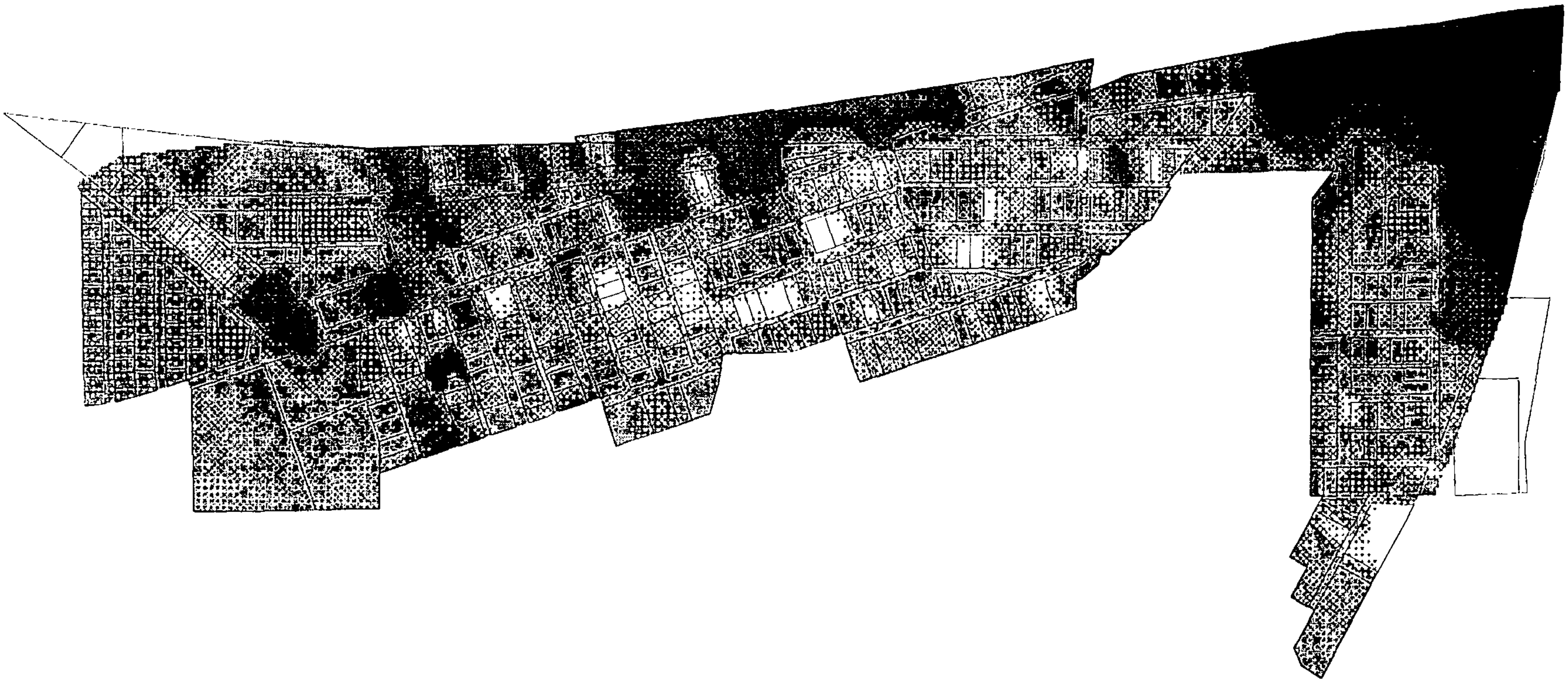
Per USEPA guidance (USEPA, 2001), technical assessment was conducted by evaluating the following three questions related to protectiveness of the implemented remedial actions:

- Question A: Is the remedy functioning as intended by the decision documents?
- Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?
- Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

### 3.2.2.1 Residential Soil Remediation

***Question A: Is the remedy functioning as intended by the decision documents?***

The review of documents, ARARs, and risk assumptions indicates that the OU1 remedy is functioning as intended by the RODs. The soil remedial strategy has been successful in achieving the blood lead RAOs and the target community mean house dust lead concentration of 500 mg/kg or less. By 2002, about 2 to 3 percent of children had blood lead



## Legend

- 0 - 349.9 mg/kg
- 350 - 999.9 mg/kg
- 1,000 - 4999.9 mg/kg
- 5,000 and greater mg/kg

N

FIGURE 3-9a

# CURRENT SUBSURFACE SOIL (BELOW BARRIER) LEAD CONCENTRATIONS FOR SMELTERVILLE, IDAHO

BUNKER HILL SUPERFUND SITE FIVE-YEAR REVIEW

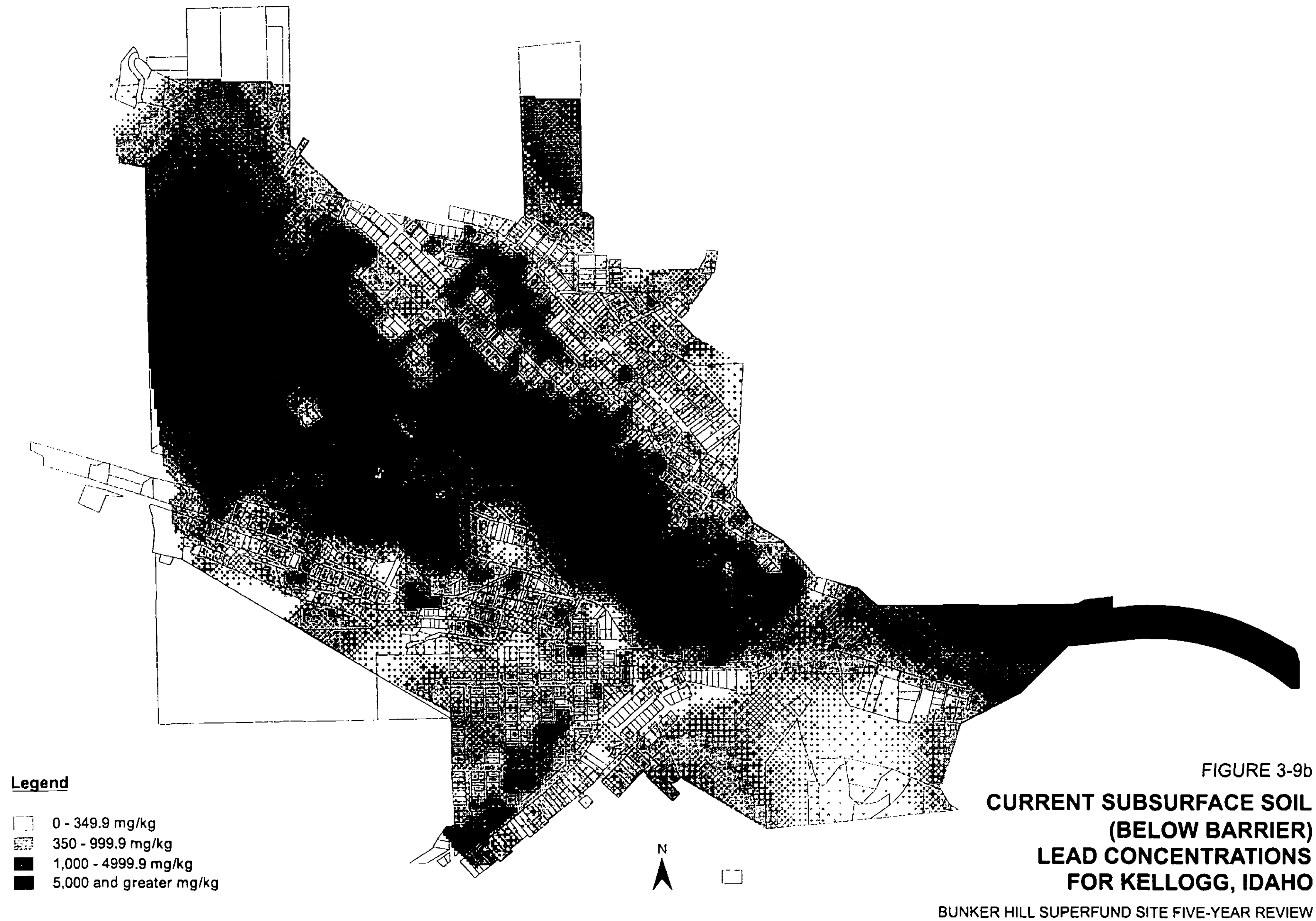



FIGURE 3-9b

**CURRENT SUBSURFACE SOIL (BELOW BARRIER) LEAD CONCENTRATIONS FOR KELLOGG, IDAHO**

BUNKER HILL SUPERFUND SITE FIVE-YEAR REVIEW

E112004005SEA . 321104.FR.01 . 3-9b Kellogg Subsurface Lead Concentrations . 16may05 . gr

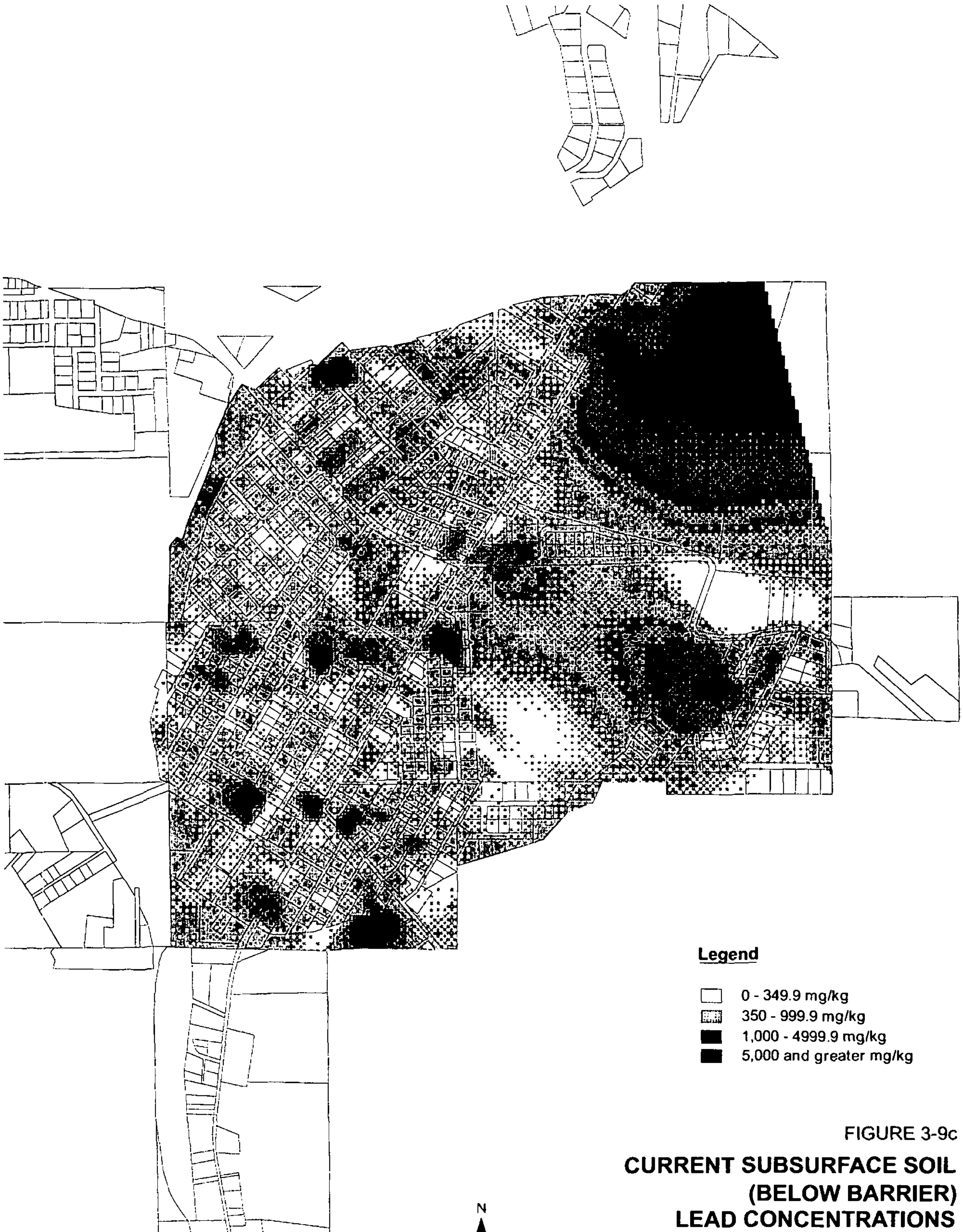



FIGURE 3-9c

**CURRENT SUBSURFACE SOIL (BELOW BARRIER) LEAD CONCENTRATIONS FOR PINEHURST, IDAHO**

BUNKER HILL SUPERFUND SITE FIVE-YEAR REVIEW

E112004005SEA . 321104.FR.01 . 3-9c Pinehurst Subsurface Lead Concentrations . 16may05 . gr levels of 10 µg/dL or greater. Less than 1 percent of children exhibited levels of 15 µg/dL or greater. The blood lead RAO was achieved by reducing soil and dust lead concentrations to levels that limited estimated mean soil and dust lead intakes for children. Lead intakes have decreased by approximately 90 percent from pre-remedial levels to the present, with levels declining from about 275 µg/day to 30 µg/day (von Lindern, 2003). A more detailed discussion may be found in Section 5 of the HHRE (TerraGraphics, 2004).

Successfully implementing the remedial strategy required a comprehensive approach to reducing soil lead exposures throughout the community. The primary soil and fugitive dust sources included residential home yards, common use areas, ROWs, commercial properties, hillsides, river floodplain, and industrial complex and waste material piles and impoundments. These remedial actions simultaneously effected reductions in soil exposure and reduced soil source contribution to house dust lead concentrations. Reduction of house dust lead to concentrations similar to post-remedial soil levels was requisite to meeting the blood lead RAOs.

As a result of the remedial strategy, house dust lead levels have been reduced to a geometric mean concentration of about 350 mg/kg for the Box in 2004. This concentration is near the 200 mg/kg lead background levels measured in similarly aged housing and socio-economically situated communities in northern Idaho outside the mining district. Geometric mean blood lead levels decreased by about 75 percent, from near 10 µg/dL in 1989 to 2.6 µg/dL in 2002. About 1.6 µg/dL of the decrease may be attributable to national initiatives to reduce lead exposure in the consumer environment. The remaining decreases occurred incrementally in association with major remedial initiatives implemented in the Box. No systematic effort was made to reduce lead paint exposure in the Box and this may be contributing to the small number of elevated dust lead levels observed. Approximately 6 percent of homes continue to show house dust levels exceeding 1,000 mg/kg lead (TerraGraphics, 2005a).

### *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?*

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. The cleanup strategy developed for the Box was based on site-specific dose-response analyses of the blood to soil/dust relationship. The RAOs were developed using an early version of what was later released as the IEUBK model for lead in 1990. The dose-response relationship used to develop the RAOs has proven to be extremely consistent as evidenced from extensive soil, dust, and blood lead data collected and analyzed annually from 1988 until 2002, when the OU1 blood lead screening program was modified (resulting in lower participation rates). The dose-response analyses have been relied on to assess remedial effectiveness and were evaluated in detail in the first five-year review and the HHRE (TerraGraphics, 2004).

The blood lead RAOs apply to each community in OU1. Table 3-6 shows that for those children tested, all communities have achieved compliance with the 10 µg/dL blood lead RAO as of 2002. Two percent of children tested in Kellogg (4 children) and 3 percent of Pinehurst children (3 children) had levels greater than or equal to 10 µg/dL in 2002. No children in the communities of Wardner and Page showed blood lead levels exceeding

10 μg/dL in 2002. Blood lead levels of children in other OU1 communities were all below 10 μg/dL (TerraGraphics, 2004).

The dose-response relationship underlying the development of the cleanup strategy was also examined for appropriateness and consistency with the larger communities. The analysis concluded that substantial reductions in lead from residential soil and dust sources have been accomplished to achieve the blood lead RAO, although the cleanup is not yet complete.

Nevertheless, there remain individual homes in some communities that do not meet soil and dust RAOs. About 5 percent of children tested in 2001 to 2002 lived in these homes. These children, and others that might move to similar residences, have a greater risk of experiencing an elevated blood lead level although this risk is expected to continue to decline as soil remediation is completed. It is unlikely that a sufficient number of these situations exist to result in exceeding the 10 μg/dL RAO for the community (Terragraphics, 2004).

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

As noted in the first five-year review for OU1 (USEPA, 2000), ongoing issues remain related to potential recontamination of protective barriers, including potential impacts from flood events. For example, recontamination of ROWs is an ongoing issue because of the impact of vehicular traffic on gravel barriers. In these areas of heavy use, protective barriers have decreased in thickness due to compaction and dislocation, which may affect long-term sustainability. While widespread recontamination of ROWs to levels of human health concern have not been observed to date, ROW recontamination will be evaluated in the next five-year review to determine if lead concentrations have remained stable.

#### 3.2.2.2 House Dust

***Question A: Is the remedy functioning as intended by the decision documents?***

Decreases in mean house dust lead concentrations have been observed as exterior soil remediation is completed, and community house dust mean concentrations have remained below 500 mg/kg since 2002.

The USEPA has not yet fully implemented the interior cleaning component of the OU1 Selected Remedy pending completion of residential soil remediation. The need for interior cleaning will be evaluated, taking into consideration ongoing house dust monitoring results and results of the 2000 pilot project, after residential soil remediation is completed in the communities.

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. The strategy to achieve the blood lead goals was to implement soil removals and capping and stabilization of contaminated areas throughout the Box to reduce house dust lead levels. In combination, these efforts have reduced children's lead intake from soils and dusts to sufficiently low levels to meet the blood lead objectives. Overall, house dust levels have been declining as residential yard cleanup progresses (TerraGraphics, 2004 and 2005b) and this trend is expected to continue as residential soil remediation is completed. House dust monitoring information will continue to be evaluated as well as other information (e.g., collected from health questionnaires) to identify trends or site-specific issues in homes that continue to exceed a dust lead concentration of 1,000 mg/kg.

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

The USEPA and the State of Idaho will consider a number of factors, including the pilot projects and the ongoing house dust monitoring results, prior to moving forward with the interior cleaning remedial action.

#### 3.2.2.3 Blood Lead Levels

***Question A: Is the remedy functioning as intended by the decision documents?***

The review of documents, ARARs, and risk assumptions indicates that the remedy is functioning as intended by the RODs. As noted in the residential soil and house dust sections, implementation of the soil remedy closely correlates to sustained reductions in children's blood lead levels below 10 μg/dL.

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. In combination, the remedial actions have reduced children's lead intake from soils and dusts to sufficiently low levels to meet the blood lead objectives.

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

Based on the attainment of the blood lead RAO, the annual blood lead screening program has been substantially scaled back. The program modifications should be evaluated annually to determine if new information warrants revisions to the program. Conducting a door-to-door blood lead screening program prior to the next five-year review (e.g., in 2009) may be considered to help document continuation of reduced blood lead levels as remedial actions are completed.

#### 3.2.2.4 Lead Health Intervention Program

***Question A: Is the remedy functioning as intended by the decision documents?***

The review of documents and site evaluations indicates that the LHIP is functioning as intended by the RODs. The LHIP continues to provide voluntary blood lead screening services, environmental and nurse follow-up for children with blood lead levels above 10 μg/dL, and education and awareness programs. Although the number of families participating in the LHIP has declined as blood lead levels declined, the LHIP will continue to provide services to children with elevated blood lead levels as well as educational programs to help children and their families identify and manage potential exposure pathways.

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. Nurse follow-up information will continue to be evaluated to help identify any trends in exposure pathways for children with elevated blood lead levels.

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

This five-year review did not find any new information that calls into question the protectiveness of the LHIP component of the remedy.

#### 3.2.2.5 Institutional Controls Program

***Question A: Is the remedy functioning as intended by the decision documents?***

The review of documents and site evaluations indicates that the ICP is functioning as designed. The PHD has implemented the program according to its regulations. Community acceptance and compliance with the program has been high. Clean barriers that have been disrupted through excavation have been repaired. New barriers have been installed as appropriate for development. Contaminated materials have been disposed in appropriate locations. Contaminant migration has been controlled to prevent recontamination of remediated properties.

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. The PHD continues to implement the ICP in a manner to maintain the 350 mg/kg lead residential community-wide average in soils. As previously noted, ongoing issues remain related to potential recontamination of protective barriers from flood events and lack of infrastructure improvements. Although these issues do not presently call into question the protectiveness of the remedy, they will be evaluated in the next five-year review.

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

Ongoing and long-term funding for the ICP is a critical component of the remedy. Upon certification of completion of all PRP remedial actions, the CD requires the PRPs to provide permanent funding for the OU1 ICP that will be placed in a trust fund or similar mechanism. As previously noted, the PRP remedial actions are expected to be completed in 2006. Therefore, permanent funding for the ICP should be in place by the next five-year review. Long-term disposal is a component of the permanent funding issue that needs to be addressed to ensure disposal locations that are free and convenient to the local user, and that facilitate future development. Additional issues include the risk of catastrophic or large-scale failure of the barrier remedy due to flood events or other causes that are beyond the control of local communities and their ability to pay.

#### 3.2.2.6 Infrastructure

***Question A: Is the remedy functioning as intended by the decision documents?***

Infrastructure (i.e., roads, sidewalks, parking lots, etc.) in OU1 is an important part of the remedy because it serves as barriers to exposure pathways between contaminated soils and humans. The infrastructure in these communities continues to serve this purpose. Under the ICP, local public entities are required to maintain the infrastructure such as roads in a manner to prevent contaminant exposures or migration. Infrastructure such as storm drain systems and flood control facilities also are relied upon to protect the installed remedy, by safely conveying storm and flood waters. In this case, the community infrastructure is not able to safely handle large flow events. To date only one flood has occurred that disrupted barriers, the 1997 Milo Creek flood. The reliance on infrastructure to help protect the remedy is appropriate, and failure to address infrastructure inadequacies in these communities may result in the loss of significant portions of the installed remedy.

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. As previously noted, ongoing issues remain related to potential recontamination of protective barriers from flood events or lack of infrastructure improvements. Although these issues do not currently affect the protectiveness of the remedy, there may be recontamination concerns if infrastructure improvements are not implemented.

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

Infrastructure improvements and ongoing maintenance of existing infrastructure are needed to ensure long-term success of the remedy. At this time, the local communities have expressed concern about their ability to fund maintenance or improvements. As roads continue to deteriorate, remedy protectiveness may be threatened by recontamination and direct exposure. The next major flooding event also may destroy or recontaminate protective barriers.

***Remedy Issues***

**Table 3-11. Summary of OU1 Issues**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **ROW Recontamination:** ROW recontamination appears to be increasing at a slow rate. | N | Y |
| **Hillside Sloughing:** Contamination from eroding hillsides adjacent to residential yards was identified as a potential source of recontamination. Most of these hillsides have been addressed, but there may be some that need to have appropriate controls installed. | N | Y |

| Table 3-11. Summary of OU1 Issues | | |
|---|---|---|
| Issues | Affects Protectiveness (Y/N) | |
| | Current (now to 1 year) | Future (>1 year) |
| **One-time Interior Cleaning:** Results of two pilot studies indicate that house dust lead concentrations return to pre-remediation levels within one year of cleaning, regardless of the cleaning method. Recent data confirms that house dust lead concentrations have achieved the community mean of 500 mg/kg and the number of homes exceeding 1,000 mg/kg lead in house dust is declining. | N | Y |
| **Institutional Controls Program (ICP):** Permanent funding of the ICP is needed to ensure success of the remedy. | N | Y |
| **Disposal/ICP Repository:** Long-term repository needs will require additional disposal capacity. | N | Y |
| **Infrastructure:** Infrastructure maintenance and improvements remain an issue. The remedy relies on functioning infrastructure to be sustainable. Resources to repair and install infrastructure have been difficult to secure by local governments. | Y | Y |

## *Recommendations*

| Table 3-12. Summary of OU1Recommendations and Follow-Up Actions | | | | | |
|---|---|---|---|---|---|
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
| | | | | Current (now to 1 year) | Future (>1 year) |
| **ROW Recontamination:** Conduct ROW sampling and analysis to determine if lead concentrations have remained stable. | IDEQ | USEPA | 12/2009 | N | Y |
| **Hillside Sloughing:** Evaluate unaddressed hillside sloughing areas adjacent to residential yards and determine if control measures are needed. | IDEQ, USEPA | IDEQ, USEPA | 12/2006 | N | Y |
| **Mine Dumps:** Assess new information regarding erosion or access concerns for mine dumps on hillsides adjacent to residential yards. | IDEQ, USEPA | IDEQ, USEPA | 12/2006 | N | Y |
| **One-time Interior Cleaning:** Evaluate need for implementation of the interior cleaning component of the remedy. Continue monitoring house dust concentrations annually as soil remediation is completed. | IDEQ, USEPA | USEPA | 12/2006 | N | Y |

| Table 3-12. Summary of OU1Recommendations and Follow-Up Actions | | | | | |
|---|---|---|---|---|---|
| | | | | Follow-up Actions: Affects Protectiveness (Y/N) | |
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Current (now to 1 year) | Future (>1 year) |
| **Lead Health Intervention Program:** Continue offering services, including blood lead screening services and follow-up nurse visits to help identify and mitigate potential exposure pathways. | PHD | IDEQ, USEPA | 12/2009 | N | Y |
| **Institutional Controls Program:** Continue offering ICP programs, including the vacuum loan program. Secure permanent funding for the ICP as required by the 1994 Consent Decree. | PHD, Upstream Mining Group (UMG) | IDEQ, USEPA | 12/2007 | N | Y |
| **Disposal/ICP Repository:** Address long-term disposal needs as part of permanent funding for ICP, as required by the 1994 Consent Decree. Evaluate need for snow disposal area. | PHD, UMG | IDEQ, USEPA | 12/2007 | N | Y |
| **Infrastructure:** Repair and regularly maintain existing infrastructure (e.g., failing roads). | Local Governments | IDEQ, PHD, USEPA | 12/2009 | Y | Y |
| Identify funding and other resources for infrastructure maintenance and improvements to protect the remedy, such as stormwater controls. | Local Governments, IDEQ, USEPA | IDEQ, PHD, USEPA | 12/2009 | Y | Y |

# 3.3 Performance Evaluation of the OU1 Remedy

The remedy being implemented in OU1 is expected to be protective of human health and the environment upon completion, provided that follow-up actions identified in Table 3-12 are implemented.

Although the remedy has not been fully implemented, environmental data (except ROWs data) indicate that the remedy is functioning as intended by the ROD. As remediation nears completion, soil and house dust lead concentrations are declining, lead intake rates have been substantially reduced, and blood lead levels have achieved their RAOs. Although house dust lead levels are declining, some individual homes continue to exceed lead concentrations of 1,000 mg/kg. For ROWs, data indicate that lead levels are stabilizing but are continuing to slowly increase over time.

There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy; however, due to the history of flooding in the area, it is possible that future flood events may affect remedy protectiveness. In addition, the ability of the local communities to improve and maintain infrastructure to protect the remedy is a concern. In the next five-year review, infrastructure improvements and ROW recontamination will be evaluated and it will be determined whether all the RAOs have been met once the remedy is completed.

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# 4 Review of Selected Remedies for OU2

This section summarizes the protectiveness evaluation of the Operable Unit 2 (OU2) remedial actions conducted to date. The individual remedial actions presented and discussed are part of the overall OU2 Selected Remedy as documented in the initial 1992 OU2 Record of Decision (ROD) (USEPA, 1992) and its subsequent decision documents (ROD amendments and Explanation of Significant Differences or ESDs). The information in this section is organized as follows:

- 4.1 Overview of the Selected Remedy, which includes Applicable or Relevant and Appropriate Requirements (ARARs)
- 4.2 OU2-Wide Considerations
- 4.3 Review of Site-Specific Work and Remedial Actions
- 4.4 Monitoring
- 4.5 Performance Evaluation of OU2 Remedy
- 4.6 References

## 4.1 Overview of Selected Remedy

Operable Unit 2 (Figure 4-1) consists of the non-populated areas of the Bunker Hill Box (OU1/OU2): the former industrial complex and Mine Operations Area (MOA), Smelterville Flats (the floodplain of the South Fork of the Coeur d'Alene River [SFCDR] in the western half of OU2), hillsides, various creeks and gulches, the Central Impoundment Area (CIA), and the Bunker Hill Mine and associated Acid Mine Drainage (AMD). The SFCDR within OU2 and the non-populated areas of the Pine Creek drainage are both addressed as part of Operable Unit 3 (OU3).

Cleanup actions identified in the 1992 OU2 ROD included a series of source removals, surface capping, re-establishment of stable creek channels, demolition of abandoned milling and processing facilities, engineered closures for waste consolidated onsite, revegetation efforts, and treatment of contaminated water collected from various site sources. The specific ROD requirements and remediation goals and objectives for the OU2 Selected Remedy are described later in this section as the individual remedial actions are discussed and evaluated.

The bankruptcy of the major Potentially Responsible Party (PRP) for OU2 (Gulf Resources) resulted in shifting responsibility for OU2 remedy implementation from a PRP to the U.S. Environmental Protection Agency (USEPA) and the State of Idaho. Pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements for fund-lead remedy implementation, the USEPA and the State of Idaho entered into the State Superfund Contract (SSC) (USEPA and IDHW, 1995) to implement the OU2 Selected Remedy. The SSC is comprised of various supporting documents including the Support Agency Cooperative Agreement (SACA) for Cost-Share, the Comprehensive Cleanup Plan (CCP), and the Remedial Action Management Plan (RAMP).

In the RAMP, the State of Idaho determined that the PRP-proposed remedy implementation strategy for OU2 was unacceptable under the statutory constraints of CERCLA, whereby the state is responsible for one hundred percent of operation and maintenance (O&M) costs after the remedy is complete. As a result, the State of Idaho and the USEPA negotiated an alternative approach to OU2 ROD implementation that focused more on permanent remedial techniques such as source control and containment, and less on long-term treatment remedial approaches originally developed by the PRP. This led to the two-phased remedy implementation approach presented in the CCP for OU2.

Phase I of remedy implementation includes extensive source removal and stabilization efforts, all demolition activities, all community development initiatives, development and initiation of an Institutional Controls Program (ICP), future land use development support, and public health response actions. Also included in Phase I are additional investigations to provide the necessary information to resolve long-term water quality issues, including technology assessments and pilot studies, evaluation of the success of source control efforts, development of site-specific water quality and effluent-limiting performance standards, and development of a defined O&M plan and implementation schedule. Interim control and treatment of contaminated water and AMD is also included in Phase I of remedy implementation. Phase I remediation began in 1995, and source control and removal activities are near completion.

Phase II of the OU2 remedy will be implemented following completion of source control and removal activities and evaluation of the impacts of these activities on meeting water quality improvement objectives. Phase II will consider any shortcomings encountered in implementing Phase I and will specifically address long-term water quality and environmental management issues. In addition, the ICP and future development programs will be re-evaluated as part of Phase II.

The effectiveness evaluation of the Phase I source control and removal activities to meet the water quality improvement objectives of the 1992 OU2 ROD will be used to determine appropriate Phase II implementation strategies and actions. In addition, although the 1992 OU2 ROD goals did not include protection of ecological receptors, additional actions may be considered within the context of site-wide ecological cleanup goals. Both ROD and SSC amendments are required prior to implementation of Phase II remedial actions.

Table 4-1 presents the volumes of contaminated material and acreage of areas capped as part of the enhanced source removal and consolidation remedial actions conducted as part of Phase I.

There have been two ROD amendments (September 1996 and December 2001) and two ESDs (January 1996 and April 1998) since the 1992 OU2 ROD was issued (see Figure 4-2 for a timeline of events in OU2). The ESDs clarified implementation aspects of portions of the Selected Remedy for OU2 consistent with Phase I objectives and did not change the Selected Remedy. The ROD amendments added additional requirements and actions to the overall OU2 Selected Remedy. These additional requirements and actions are briefly discussed below.

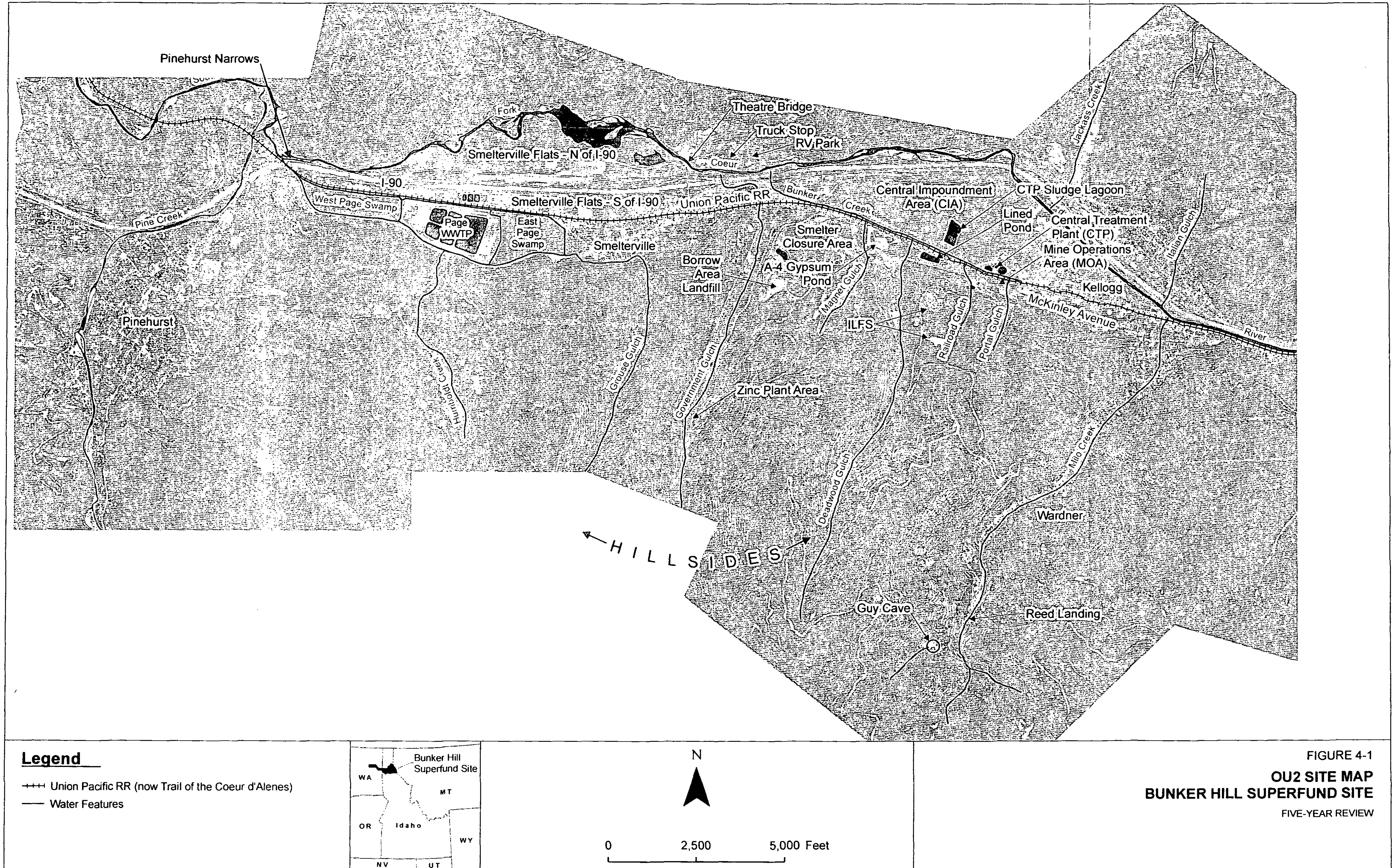


FIGURE 4-1

**OU2 SITE MAP**
**BUNKER HILL SUPERFUND SITE**

FIVE-YEAR REVIEW

File Path: Z:\USEnvironmentalProte\321104\GIS\MapDocuments\Mxds\5-Year Review\Figure 4-1.mxd

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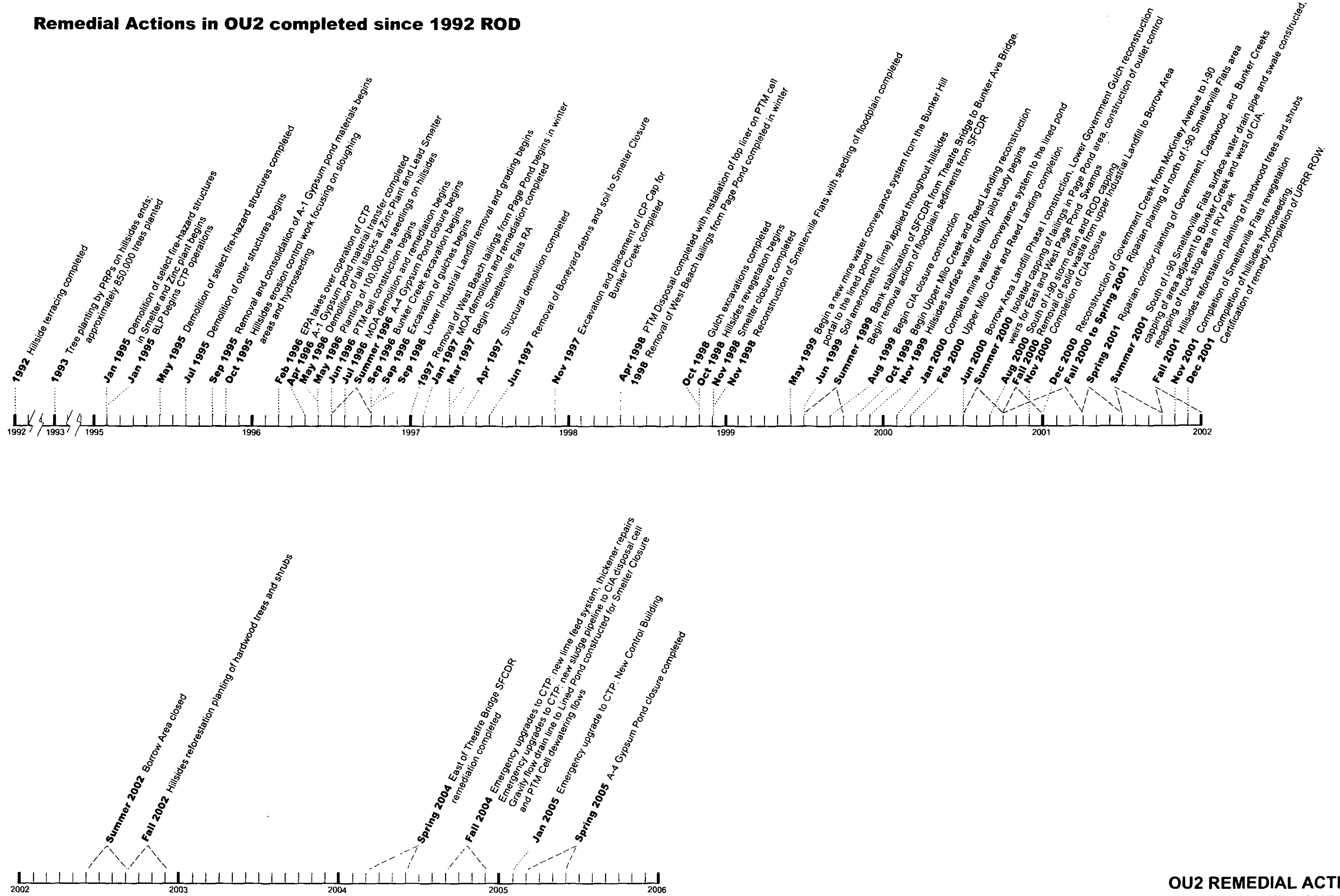


FIGURE 4-2
**OU2 REMEDIAL ACTION TIMELINE**
**BUNKER HILL SUPERFUND SITE**
FIVE-YEAR REVIEW

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**Table 4-1. Summary of OU2 Phase I Remedial Actions to Date**

| Area | Approximate Removal Quantity (cy) | Approximate Capped Area (acres)[a] | Other |
|---|---|---|---|
| Hillsides | N/A | N/A | 1,088.5 acres revegetated through 2004[b] |
| Grouse Gulch | 5,000[c] | N/A | Stabilization of creek channel, revegetation |
| Government Gulch | 700,000[d] | 75[d] | Re-establish natural creek channel, demolition of industrial facilities in gulch, removal of demolition debris to Smelter Closure, revegetation. |
| Magnet Gulch | 211,500[e] | 10.5[d] | Re-establish natural and rock-lined creek channel |
| Railroad Gulch | Included in Mine Operations Area | | |
| Smelterville Flats – North of I-90 | 1,300,000[c] | 190.5[f] | River bank stabilization, revegetation of flood plain |
| Smelterville Flats – South of I-90 | 300,000[c] | 103[f,g] | Includes capped acreage up to Slag Pile Area, stormwater drainage system, revegetation |
| Central Impoundment Area | N/A | 260[h] | 2.6 million cy added to CIA, geomembrane cover system, slopes covered (rock or vegetated) |
| Page Pond | 40,000 | N/A | Tailings removed from West Beach in the West Page Swamp |
| Smelter Closure | N/A | 44[f] | Consolidation area for demolition debris, 826,000 cy added to the 128,000 already in place[a],full encapsulated PTM cell, geomembrane cover system, revegetated. |
| Borrow Area | [i] | 36[g] | |
| Mine Operations Area (including Boulevard area and Railroad Gulch)[j] | 38,000[c] | 17.5[j] | Demolition of industrial facilities |
| Bunker Creek | 37,500[c] | N/A | Re-establish natural creek channel, revegetate |
| Milo Creek | 98,000[c] | N/A | Reed Landing structure |
| SFCDR E. of Theatre Bridge | 88,970[k] | N/A | |
| UPRR ROW | 28,676[l] | 47.5[g] | |
| Deadwood Gulch | 485,000[m] | N/A | Stabilization of creek channel, revegetation |
| Theatre Br. Area N. of SFCDR | N/A | 34[g] | |
| Total | 3,332,646 | 818 | |

[a] Does not include riprap or rock-lined channels.
[b] CH2M HILL, 2004c.
[c] TerraGraphics, 2001.
[d] Morrison Knudsen Corporation, February 23, 1999a.
[e] Morrison Knudsen Corporation, February 23, 1999b.
[f] TerraGraphics, 1999.
[g] GIS calculation based on as-built drawings and/or estimated from aerial images - rounded to the nearest .5 acre.
[h] USEPA, 2000a.
[i] The Borrow Area was a clean material source and later became a contaminated soil repository. Contaminated material at the Borrow Area (near-surface material) was stockpiled and used for soil cap (manufactured soil) at the Smelter Closure. The clean material was used for fill and soil caps throughout the site. The Borrow Area benches were later used to create the Borrow Area Landfill.
[j] Preliminary numbers
[k] Zilka, 2005. Unpublished.
[l] MFG, 2001a.
[m] Zilka and Hudson, 2000.

The 1996 OU2 ESD addressed differences associated with placing Zinc Plant demolition materials in the Smelter Closure Area (SCA), disposal of a portion of the A-1 Gypsum Pond materials in the SCA, and removal and disposal of Industrial Landfill materials in the SCA (USEPA, 1996b).

The 1996 OU2 ROD Amendment changed the Selected Remedy for Principal Threat Materials (PTMs) from chemical stabilization to containment. Under the 1996 OU2 ROD Amendment, PTMs would be contained in a fully lined monocell within the SCA (Section 4.3.6). Mercury-contaminated PTMs were chemically stabilized prior to placement in the PTM monocell (USEPA, 1996a).

The 1998 OU2 ESD addressed differences associated with the stabilization and removal of contaminated materials located in the tributary gulches within OU2 (Section 4.3.2), the USEPA financial contribution to the lower Milo Creek/Wardner/Kellogg pipeline system (Section 4.3.11), placement of mine wastes from outside of OU2 in the CIA (Section 4.3.4), precipitation diversion work associated with Smelterville Flats south of Interstate 90 (I-90) (Section 4.3.3), demolition of the tall stacks at the Lead Smelter and Zinc Plant (Section 4.3.6), decontamination versus demolition of the Zinc Plant Concentrate Handling Building and Warehouse (Section 4.3.6), and demolition of the Phosphoric Acid/Fertilizer Plant Warehouse (Section 4.3.6) (USEPA, 1998)

The 1992 OU2 ROD addressed Bunker Hill Mine AMD by requiring that it continue to be treated in the Central Treatment Plant (CTP) prior to discharge to a wetlands treatment system for removal of residual metals. During studies conducted between 1994 and 1996 by the United States Bureau of Mines (USBM), the wetlands treatment system was found to be incapable of meeting the treatment levels estimated in the Feasibility Study (FS) and required by the 1992 OU2 ROD. The 1992 OU2 ROD did not contain or otherwise identify any plans for the control or long-term management of the mine water flows or alternatives for treatment of site waters originally slated for treatment in the constructed wetlands. The 1992 OU2 ROD also did not address the long-term management of sludge from the CTP. To address these issues, the USEPA began the Mine Water Remedial Investigation/Feasibility Study (RI/FS) in 1998 (CH2M HILL, 2001a). This study focused on the AMD drainage issues associated with the Bunker Hill Mine and the long-term water treatment needs for OU2. The subsequently issued 2001 OU2 ROD Amendment (USEPA, 2001a) included the additional remedies and requirements to address:

- AMD source control to reduce the quantity of surface water entering the mine and AMD generated within the mine;
- AMD collection and control within the Bunker Hill Mine;
- AMD conveyance from the Kellogg Tunnel to the CTP;
- AMD storage in the Lined Pond and the Bunker Hill Mine pool;
- AMD treatment in an upgraded CTP;
- Management of treatment residuals (sludge); and
- Establishment of remediation goals and discharge limits for AMD treatment.

To date, the USEPA and the State of Idaho have not concluded negotiations on a SSC amendment that allows for full implementation of this ROD amendment. Time-critical components of the 2001 OU2 ROD Amendment were implemented, however, to avoid potential catastrophic failure of the CTP and to provide for emergency mine water storage (USEPA and IDEQ, 2003).These time-critical activities focused on preventing discharges of AMD to Bunker Creek and the SFCDR. Until an SSC amendment is signed allowing for full implementation of the 2001 OU2 ROD Amendment, control and treatment of AMD and its impact on water quality will continue to be an issue. The USEPA and the State of Idaho continue to discuss the SSC amendment and the long-term obligations associated with the mine water remedy.

### 4.1.1 OU2 ARARs Review

The remedies selected in RODs, ROD amendments, and ESDs are intended to be protective of human health and the environment and to comply with the federal and state standards that are applicable or relevant and appropriate requirements.

As part of the initial five-year review conducted in 2000, the ARARs and To Be Considered (TBC) guidance identified in the 1992 OU2 ROD were reviewed, and any new or revised standards were identified and summarized within the 2000 OU2 five-year review report. Based upon this review, the USEPA determined that the 1992 ARARs and TBCs were still protective of the remedies for OU2 (USEPA, 2000a).

With this second five-year review, the 1992 OU2 ROD ARARs and TBCs were again reviewed, as well as those in the 2001 OU2 ROD Amendment. All were evaluated against new or revised standards promulgated since the last five-year review. As with the first review, the USEPA has determined that the OU2 ARARs and TBCs are still protective.

Below is a brief discussion of the standards that have been revised or promulgated since the last five-year review.

#### 4.1.1.1 Threshold Limit Values for Workplace Airborne Hazards

Threshold limit values (TLVs) are heath-based guidelines (not standards) prepared by the American Conference of Governmental Industrial Hygienists (ACGIH) to assist industrial hygienists in making decisions regarding safe levels of exposure to various airborne hazards found in the workplace. A TLV reflects the level of exposure that the typical worker can experience without an unreasonable risk of disease or injury.

In the 1992 OU2 ROD, the TLVs for releases of certain airborne contaminants of concern during remedial actions were considered relevant and appropriate site-wide. These were for antimony, arsenic, cadmium, copper, lead, mercury, and zinc. Since the last five-year review report for OU2, new TLVs for arsenic, cadmium, lead, and mercury vapor have been established. These new values are being considered in subsequent OU2 remedial actions, and are to be part of each health and safety plan for protection of onsite workers. These new levels do not impact the protectiveness of the OU2 remedy.

#### 4.1.1.2 Slope Stability

In the 1992 OU2 ROD, the USEPA determined that certain sections of the Surface Mining Control and Reclamation Act (SMCRA) of 1997[1] were relevant and appropriate for removal and backfilling of contaminated soils. This Act was revised in July of 2003 to add a requirement to achieve a post-action slope not exceeding angle of repose or such slope as is necessary to achieve a long-term static safety factor of 1.3 to prevent slides. The 1992 OU2 ROD identified the static safety factor as 1.0; however, cut or engineered slopes in OU2 were analyzed and designed to conform to a minimum static long-term factor of safety of 1.5, and a minimum short-term dynamic factor of safety of 1.0. Since slopes in OU2 were designed and constructed using a more stringent safety factor, the 2003 revised requirement does not impact the protectiveness of the OU2 remedy.

#### 4.1.1.3 Drinking Water Quality: Safe Drinking Water Act (40 CFR Section 141)/Idaho Drinking Water Regulations (IDAPA 58.01.08.050)

These regulations are applicable to all public drinking water systems and private wells that supply drinking water to residents of Operable Unit 1 (OU1) and OU2. They require that contaminant concentrations in drinking water remain below maximum contaminant levels (MCLs) and non-zero MCL goals (MCLGs). The 1992 OU2 ROD identified these regulations as relevant and appropriate for groundwater that could be used for drinking water purposes in the future. To meet these requirements, remedial actions have limited contamination to and exposure from groundwater through source removals and containment and the closure of onsite wells.

On February 22, 2002, the USEPA lowered the MCL for arsenic from 0.05 milligrams per liter (mg/L) to 0.01 mg/L.[2] Public water system suppliers must comply with this new MCL by January 2006. At such time that the USEPA completes Phase I remedial activities and evaluates the effectiveness of these activities in meeting water quality improvement objectives, including drinking water requirements, the USEPA will determine whether the Selected Remedy for OUs 1 and 2 will attain the Safe Drinking Water Act (SDWA) groundwater MCLs identified as ARARs in the 1992 OU2 ROD, as well as the above revised arsenic MCL. Until that time, the USEPA will continue to perform actions that limit groundwater use for drinking water purposes.

#### 4.1.1.4 Surface Water Quality: IDAPA 58.01.02 Idaho Water Quality Standards and Wastewater Treatment Requirements

The 2001 OU2 ROD Amendment to address AMD from the Bunker Hill Mine identified the Idaho Water Quality Standards and Wastewater Treatment requirements (IDAPA 58.01.02) as applicable for the CTP effluent where it discharges into Bunker Creek, as well as applicable site-wide for construction or human activities conducted that may result in discharges to surface water.

Since the amendment, two sections of the standards and requirements have been revised and approved by the USEPA:

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1 30 CFR Parts 816.11; 816.95; 816.97; 816.100; 816.102; 816.107; 816.111; 816.113; 816.114; 816.116.

2 66 FR 7061; incorporated by reference into IDAPA 58.01.08.050

- The numeric criteria for toxic substances for waters designated for aquatic life, recreation, or domestic water supply use (58.01.02.210) were revised in 2003 to incorporate the National Toxics Rule (NTR) numeric criteria table, rather than just include by reference. No numeric criteria were changed with this revision.
- Site-specific aquatic life criteria for cadmium, lead, and zinc (58.01.02.284) were revised and approved by the USEPA in January 2003. These new criteria apply to the SFCDR subbasin[3], as well as all surface waters within this subbasin, except for natural lakes, for which the statewide criteria in Section 210 apply. The revised criterion for cadmium is more stringent than the previous Idaho criterion. In comparison with the current national USEPA recommended aquatic life requirements, Idaho's acute site-specific criterion for cadmium is the same as the USEPA's recommended acute requirement. Idaho's chronic site-specific criterion is less stringent than the USEPA's recommended chronic requirement. The revised criteria for lead and zinc are nominally less stringent than the previous Idaho standards; however, they include no lower cap on hardness, so in very low hardness water, these criteria will be more stringent. These new site-specific criteria for cadmium, lead, and zinc are expected to provide the same level of protection intended by current national USEPA recommendations; and,
- A third section has also been revised and adopted by the State; however, the USEPA has yet to approve this revision:

  IDAPA 58.01.02.260.02 was revised to grant a variance for meeting certain water quality standards for the SFCDR Sewer District's Page Wastewater Treatment Facility. This variance includes ammonia, chlorine, cadmium, lead, and zinc discharged to the West Page Swamp.

The revision to the State's toxic criteria requirement does not call into question the protectiveness of the OU2 remedy. In regard to the revised Idaho site-specific aquatic life criteria for cadmium, lead, and zinc, the current design of the CTP will meet the more stringent criteria in the 2001 OU2 ROD Amendment. When the USEPA completes Phase I remedial actions and evaluates their effectiveness in meeting Box water quality improvement objectives, the USEPA will determine whether the selected remedies for OU2 will attain the aquatic life criteria identified as an ARAR in the 2001 OU2 ROD Amendment, including the revised criteria for cadmium, lead, and zinc.

In regard to the proposed revisions to the site-specific Page Wastewater Treatment Facility, the USEPA will continue to work with the Idaho Department of Environmental Quality (IDEQ) and other stakeholders to clarify the National Pollution Discharge Elimination System (NPDES) issues that must be addressed prior to completion of the remaining remedial actions for Page Ponds.

#### 4.1.1.5 Other Miscellaneous Changes: Renumbering of State of Idaho Environmental Rules

When the 1992 OU2 ROD was written, the State of Idaho's governmental entity in charge of environmental protection was a division of the Idaho Department of Health and Welfare (IDHW). In July 2001, this division became the IDEQ. With this organizational change, the State's environmental rules were renumbered from the 16.01 series to the 58.01 series. The

[3] Hydrologic Unit Code [HUC] 17010302

appropriate 58.01 series rules are identified in the 2001 OU2 ROD Amendment. This renumbering does not impact the protectiveness of the OU2 remedy.

### 4.1.2 Soil Excavation Goals

During the implementation of Phase I of the Selected Remedy for OU2, a chemical -specific soil excavation goal of 1,000 milligrams/kilogram (mg/kg) lead was used for the OU2 source removal actions, with the exception of the north of I-90 Smelterville Flats (Section 4.3.3) removal action and areas within Government and Magnet Gulches (Section 4.3.2).

The 1,000 mg/kg lead excavation goal is based on human health risk levels and not ecological risk levels. However, as part of the OU2 Phase I remedy evaluation and consideration of potential OU2 Phase II remedy, additional actions may be considered within the context of site-wide ecological cleanup goals.

Clean replacement or capping soil contained arsenic less than 100 mg/kg, cadmium less than 5 mg/kg, and lead less than 100 mg/kg. Chemical-specific debris and processing waste cleanup levels were not specified; however, materials that could not be reprocessed or recycled were either stabilized or were contained onsite in specifically designed repositories.

Institutional controls (ICs) were implemented onsite for those areas where a barrier has been placed and/or lead concentrations exceed the residential community average of 350 mg/kg, with no property exceeding 1,000 mg/kg lead.

## 4.2 OU2-Wide Considerations

This section summarizes aspects of the OU2 remedy that apply to the entire OU as opposed to area-specific remedial actions.

### 4.2.1 Institutional Controls Program

The ICP in OU2 is the same as the ICP program implemented in OU1 as discussed in Section 3.2.1.5. The State of Idaho provides funding for the OU2 ICP, including costs for Page Repository operations associated with disposal from the non-populated areas of the Box. The State of Idaho will create an irrevocable trust to fund the OU2 ICP in the long term. Initial costs for the OU2 ICP have been low because of the small population in the area and lack of development to date in OU2 compared to OU1. The ICP has issued 58 permits since the last five-year review in OU2 (Table 4-2). As mentioned in Section 3.2.1.5, the State pays 16 percent of general ICP costs to cover OU2 activities. The total cost of the OU2 ICP program for the last five years has been $129,447 including general costs, with annual expenditures averaging $25,889. The costs of implementing the ICP for OU2 are expected to increase over time as development progresses.

The IDEQ and the USEPA recognize that securing long-term funding for the OU2 ICP is a critical issue. The IDEQ and the USEPA agree that the ICP has both remedial action and O&M components. The 1995 SSC identifies $300,000 of the OU2 ICP costs to be O&M. As part of resolving long-term funding, the IDEQ and the USEPA will need to reach agreement on the components of the OU2 ICP that are considered remedial action or O&M.

**Table 4-2. OU2 ICP Permits Issued (2000 - 2004)**

| Permit Type | Permits Issued | | | | | |
|---|---|---|---|---|---|---|
| | 2000 | 2001 | 2002 | 2003 | 2004 | Total |
| Large Projects, Non-Populated | 5 | 12 | 6 | 10 | 25 | 58 |
| Interiors, Non-Populated | 0 | 0 | 0 | 0 | 0 | 0 |
| Subdivision/PUDs, Non-Populated | 0 | 0 | 0 | 0 | 0 | 0 |
| Demolition, Non-Populated | 0 | 0 | 0 | 0 | 0 | 0 |
| Records of Compliance, Non-Populated | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | 5 | 12 | 6 | 10 | 25 | 58 |

The ICP in OU2 faces challenges similar to OU1. Utilities and infrastructure improvements, repair, maintenance, and installation involve excavation and generation of materials with elevated levels of lead and other associated metals. As a result, most infrastructure projects involve the handling and disposal of these materials, requiring additional cost and special procedures. Significant disposal amounts will be generated from infrastructure development projects in OU2; therefore, it is critical that repository locations be identified to meet the disposal needs required by ICP compliance. Additional locations for disposal beyond the current Page Ponds repository will likely be needed.

### Technical Assessment

Per USEPA guidance (USEPA, 2001b), technical assessment of the ICP was conducted by evaluating the following three questions related to its protectiveness:

#### *Question A: Is the remedy functioning as intended by the decision documents?*

The ICP has been functioning as designed. The Panhandle Health District (PHD) has implemented the program according to its regulations. Community acceptance and compliance with the program have been high. Clean barriers that have been disrupted through excavation have been repaired. New barriers have been installed as appropriate for development. Contaminated materials have been disposed in appropriate locations. Contaminant migration has been controlled to prevent recontamination of remediated properties.

#### Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. The PHD continues to implement the ICP in a manner that maintains the residential community average of 350 mg/kg lead in residential yards, with no property exceeding 1,000 mg/kg lead.

#### *Question C: Has any other information come to light that could call into question the protectiveness of the remedy.*

The OU2 ICP faces issues both unique and similar to OU1. The similar issues include:

- Maintaining a consistent source of funding;
- Ensuring disposal locations that are at no cost to the local user, are convenient to the local user, and facilitate future development; and
- Managing failure of protective barriers due to catastrophic flood events or other causes that are beyond the control of local communities and their ability to fund the repair of disturbed barriers.

An issue that is unique to OU2 is the need for more complete information regarding what areas received barriers, the depths of barriers, and the contamination levels left behind following Phase I remedial actions. This information is needed for the ICP property status records in this area and will be collected for inclusion in the OU2 ICP database.

### Remedy Issues

**Table 4-3. Summary of OU2 ICP Remedy Issues**

| Remedy Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **Funding:** Permanent funding of the ICP is needed to ensure success of the remedy. At this time, permanent funding for the OU2 ICP has not been secured. | N | Y |
| **Disposal/ICP Repository:** Long-term repository needs will require additional disposal capacity. | N | Y |
| **ICP Database:** Type and depth of barrier and contamination left behind for OU2 areas needs to be incorporated into ICP database to support long-term ICP management. | N | Y |

### Recommendations

**Table 4-4. Summary of Recommendations and Follow-up Actions for OU2 ICP**

| Recommendations/ Follow-up Actions | Party Responsible | Oversight Agency | Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Funding:** Create irrevocable trust to provide consistent cash flow for ICP operation into perpetuity. | IDEQ | IDEQ, USEPA | 12/2009 | N | Y |
| **ICP Disposal/Repository:** Establish long term disposal plan for ICP-generated wastes. | IDEQ, PHD, USEPA | USEPA | 12/2006 | N | Y |
| **ICP Database**: Collect information for ICP property database. | IDEQ, PHD, USEPA | IDEQ | 12/2007 | N | Y |
| **Barrier Maintenance:** Identify funding and other resources for infrastructure maintenance and improvements to protect the remedy, such as stormwater controls. | Local Governments, IDEQ, USEPA | USEPA | 06/2009 | N | Y |

### 4.2.2 Health and Safety Review

Construction work funded by the USEPA and the State of Idaho at OU2 was performed under the U.S. Army Corps of Engineer's (USACE) Safety and Health Requirements Manual EM 385-1-1 (USACE, 2003). In addition, each of the USACE's remediation contractors working at the site prepared their own project-specific health and safety (H&S) plan that met the requirements of the USACE's site-wide plan. H&S plans prepared by remediation contractors were then submitted to the USACE to ensure that H&S plans were in place. Within any given area of the Site, both the USACE's H&S plan and the remediation contractor's project-specific H&S plan would be in effect for all personnel in that area. Contractors were responsible for H&S for their own projects, including subcontractors, although the USACE monitored and enforced operations for H&S compliance over the entire site (Fink, 2004). Accordingly, the prime contractor at OU2 operated under its own project-specific H&S plan that was consistent with requirements of the Occupational Safety and Health Administration's (OSHA) Hazardous Waste Site Regulations.[4]

The H&S plans typically covered the following information:

- Hazard evaluation of the site and work performed at the site;
- Training requirements for any and all personnel;
- Actions required for medical surveillance of workers;
- Required personal protective equipment;
- Health and safety monitoring, including air, noise, heat stress, confined space, perimeter, and mercury vapor monitoring;
- Personnel sampling for lead exposure, asbestos, total and respirable dust, cadmium, and arsenic;
- Health and safety work precautions and procedures;
- Site control measures such as establishment of work, support, contamination reduction, and exclusion zones, and related procedures;
- Personnel and equipment decontamination and hygiene procedures;
- Onsite first aid;
- Emergency response plan; and
- Record-keeping requirements.

Subcontractors operated under a prime contractor's H&S plan or, in the case of specialty work, prepared a site- and activity-specific H&S plan that was reviewed and accepted by both the prime contractor and the USACE.

[4] 29 CFR 1910.129 and 29 CFR 1926.65

Success of the H&S procedures and safety emphasis at the site can be judged by the fact that from 2000 through November 2004 no lost-time accidents or injuries occurred. For this period of time, over 176,600 safety exposure man-hours were logged on the project by a work force of over 90 personnel and over 500 pieces of heavy equipment.

### 4.2.3 Operation and Maintenance Plan

In 1999, the IDEQ and the USEPA began planning for the transfer of O&M responsibilities from the federal government to the State of Idaho for those portions of the Bunker Hill Superfund Site that were cleaned up under the government-implemented program. In a joint effort by the IDEQ and the USEPA, the majority of the O&M manuals have been drafted for each of the government-implemented remedial action areas. The PRPs are responsible for preparing O&M plans and manuals and conducting long-term O&M for their cleanup areas.

Until the performance standards for specific remedial actions are met and the State takes over the O&M of those areas, ongoing monitoring and any necessary repair of completed remedial actions are being performed by the USEPA through its contract with the USACE. At present, the USACE site personnel periodically inspect completed remedial activities for any issues and conduct repairs or modifications as necessary.

O&M work that has been conducted on individual remedial actions since the initial 2000 five-year report is noted in the following sections under discussions for each remedial action.

## 4.3 Review of Site-Specific Work and Remedial Actions

### 4.3.1 Hillsides

The hillsides include the steep portions of OU2 that slope upward from the floor of the SFCDR valley and from the gulches (Figure 4-3). This section discusses the hillsides remedial actions and the removal actions required for the two industrial landfills located between Deadwood and Railroad gulches. "Gulches" or "gulch areas", as used in the 1992 OU2 ROD and this five-year review, include the flat portions of the gulches exclusive of the hillsides and are addressed in a separate section of this report (4.3.2).

#### 4.3.1.1 Review of ROD, ESD & ROD Requirements

In the 1992 OU2 ROD, the remedial action for the hillsides was based on the 1990 Administrative Order on Consent (AOC) with Gulf Resources and the Hecla Mining Company for Revegetation and Stabilization.[5] The major requirements of the 1992 OU2 ROD are shown in Table 4-5. The remedial action is to focus on the approximately 3,200 acres of hillsides identified in the AOC work plan. These areas were selected as the areas that were severely eroded, having less than 50 percent vegetative cover. This is based on the RI (Dames & Moore, 1990) that evaluated about 12,000 acres of the hillsides. Severely eroded areas within the area that had more than 50 percent vegetative cover are also to be

[5] Administrative Order on Consent; Bunker Hill Superfund Site: Hillsides Revegetation/Stabilization Removal Order; United States Environmental Protection Agency v. Gulf Resources & Chemical Corporation and Hecla Mining Company; EPA Docket No. 1090-10-01-06; October 1, 1990.


**Legend**

- Hillsides Revegetated Areas
- Industrial Landfill Removal Areas
- Water Features

N

0 1,000 2,000 Feet

FIGURE 4-3

**OU2 HILLSIDES SITE MAP**
**BUNKER HILL SUPERFUND SITE**

FIVE-YEAR REVIEW

File Path: Z:\USEnvironmentalProte\321104\GIS\MapDocuments\Mxds\5-Year Review\Figure 4-3.mxd

revegetated. The 1992 OU2 ROD also called for monitoring the performance of vegetation and maintaining erosion control structures until revegetation efforts are proven successful.

**Table 4-5. Hillsides Remedial Actions Required**

| ROD Requirements | Remedial Action Objective/Goal |
|---|---|
| **1992 OU2 ESD** | |
| Contouring, terracing and revegetation of areas with <50 percent cover (Section 9.2.1) | Reduce erosion and increase infiltration |
| Spot revegetation of areas with >50 percent cover within areas that are >50 percent cover class and have high potential for contaminant transport (Section 9.2.1) | Control erosion and increase infiltration |
| Surface armor or soil cover on selected mine waste rock dumps (Section 9.2.1) | Control direct contact or erosion hazard |
| Enforce existing controls on access (Section 9.2.1) | Human contact |
| Maintain existing fencing (Section 9.2.1) | Human contact |
| Solid waste from the Industrial Landfills located on the east side of Deadwood Gulch will be capped with a low permeability Soil cover. Disturbed areas will be revegetated or receive other appropriate permanent barrier. (Section 9.2.5) | To reduce surface infiltration through potential source materials; to reduce potential groundwater loadings from these sources |
| **1998 OU2 ESD** | |
| Solid waste from the Industrial Landfills located on the east side of Deadwood Gulch may be excavated and disposed at either the Smelter or CIA Closure areas. Contour and revegetate disturbed areas. | Reduce surface infiltration through potential source materials; to reduce potential groundwater loadings from these sources |

Project goals identified the desired end-point for land management. The 1990 AOC called for areas having less than 50 percent cover to be revegetated, as well as for the implementation of a number of slope stabilization and erosion control measures. The 1992 OU2 ROD also discussed a USEPA-approved PRP work plan that sought 85 percent ground cover by plants within 8 to 12 years. It emphasized the establishment of 100-foot-wide riparian corridors. However, the 1992 OU2 ROD did not identify which stream systems were to receive this treatment, nor did it state that all streams must receive treatment. The 1992 OU2 ROD set expectations for revegetation efforts to occur in areas where there is a high potential for contaminant transport and to develop new access where it is environmentally acceptable.

In addition to the objectives/goals identified above, biological monitoring is an important component of the Hillsides remedial action with respect to evaluating potential impacts on environmental receptors. The Hillsides remedial action includes extensive efforts to contain or manage contaminants posing an environmental threat; however, residual contamination remains present. The OU2 FS (MFG, 1992a) and the 1992 OU2 ROD identified that certain areas of OU2, and in particular the hillsides adjacent to the Smelter Complex, may have a potential to impact sensitive species of plants and animals after implementation of remedial actions as a result of contamination left in place. The 1992 OU2 ROD did not establish specific soil cleanup goals (ARARs) to evaluate risk to environmental receptors. However, the ecological risk assessment (SAIC, 1991) developed soil toxicity reference concentrations that are intended to serve as an indicator of potential impact.

While residual contamination may pose a potential threat to environmental receptors at the site, the FS and 1992 OU2 ROD determined that remediation of all hillside areas to levels below soil toxicity reference contamination was infeasible. Habitat establishment was, however, determined to be both feasible, and desirable, and is a component of all alternatives presented in the FS. The 1992 OU2 ROD further discusses that as habitat is established, and environmental receptors are exposed to residual soil contamination, monitoring will be conducted to evaluate actual impacts to resident populations. Section 4.4.3, Biological Monitoring, summarizes the biological monitoring program being conducted within OU2.

#### 4.3.1.2 Background and Remedial Actions Up to Year 2000

The hillsides within the Bunker Hill Superfund Site have been impacted by 100 years of mining and metals-refining related activities. These activities include logging and clearing, mine waste rock dumping, and emissions and fugitive dust from processing operations. Natural events such as forest fires, wind, and flooding have increased the impacts to the hillsides leading to severe erosion and reduced vegetation in many areas. The erosion of the contaminated soils from the hillsides has resulted in contaminants being conveyed to the streams, gulches, and other areas. A series of consensus-based workshops (two in 1998 and one in 1999) were convened by the USEPA to refine the purpose, goals, objectives, and interim performance standards (IPSs) of hillsides remedial actions to address the general guidance provided in the 1992 OU2 ROD. The guidance statements generated by these workshops and the monitoring plan developed from the guidance statements are discussed in the *Bunker Hill Hillsides Revegetation Conceptual Plan and Monitoring Plan* (CH2M HILL, 1999). These guidance statements formed the basis for long-term monitoring of hillside revegetation performance, which provides the data for adaptive management. IPSs were used for monitoring hillside performance because of the significant uncertainty about the specific relationships between plant cover on hillside soils and various watershed functions. As the hillsides were revegetated, monitoring data were expected to clarify these relationships. As such, the IPSs were developed with the expectation that final performance standards (FPSs) would be developed as site remediation activities matured and the environment of the hillsides stabilized.

Table 4-6 presents the various Bunker Hill hillsides remediation activities conducted before 2000.

| **Table 4-6. Hillsides Remediation Prior to Year 2000** |
|---|
| Between 1975 and 1982, the Bunker Hill Company planted approximately 2 million tree seedlings over 2,290 acres of the site. In 1991, Pintlar, (affiliated with OU2's primary PRP, Gulf Resources), planted 140,000 tree seedlings on just under 300 acres and hydroseeded a total of 45 acres. In 1992 and 1993, Pintlar scheduled approximately 1,287 acres to be planted in these 2 years. However, because this effort was not fully documented, it is uncertain how many acres or trees were actually planted. Pintlar planted 100-400 trees per acre on 758 acres and 400-450 trees per acre on 215 acres in 1994. |
| Between 1990 and 1992, the PRPs cut "zero-grade" bench terraces over the hillsides for erosion control and hillside stabilization. Approximately 69 miles of terraces were constructed. Terrace construction shortened slope length, promoted infiltration of runoff into the hillside terraces, and reduced water velocity as it flowed down the hillsides. The first five-year review report for OU2 describes the terraces in more detail (USEPA, 2000a. |
| PRPs also installed check dams to minimize further erosion in gullied areas, and erosion control measures at select mine waste dumps. |

| **Table 4-6. Hillsides Remediation Prior to Year 2000** |
|---|
| In 1994, the USEPA and the State of Idaho assumed the responsibility for hillsides remedial work. In 1996, the USEPA and the State planted 200,000 white pine seedlings in areas that had not been planted by the PRPs. In the fall of 1998 approximately 254 acres were limed and hydroseeded. In the spring of 1999, the USEPA and the State limed an additional 834 acres at varying rates of which 365 acres were subsequently hydroseeded in the fall of that year. |
| Slope Stabilization - Towns of Wardner and Smelterville: In 1997, the USEPA and the State performed hillside stabilization activities at discrete areas at the base of the Smelterville hillside that consisted of cleaning out sloughed soil, reinforcing existing catchment walls, and constructing additional gabion walls to prevent sloughing soil from entering remediated yards. In 1999, the USEPA and the State restored capacity behind existing cribbing walls in Wardner by removing accumulated sediment and soil. Also in 1999, BLP removed discrete small mine dumps from the hillside above Wardner. |
| In 1998 and 1999, the USEPA built hundreds of check dams along the hillside terrace benches, including straw-bale, log, and concrete "ecology block" dams. More information on check dams can be found in the first five-year review report for OU2 (USEPA, 2000a). |
| Solid waste from the lower Industrial Landfill located between Deadwood and Railroad Gulch was removed and disposed in the CIA in 1996. The area was regraded for erosion control purposes by matching existing site contours. No capping was done as all waste material was removed. |

### 4.3.1.3 Actions Since Last Five-Year Review

A workshop was held with the USEPA, the USACE, the U.S. Bureau of Land Management (BLM), the IDEQ, and CH2M HILL on August 11, 2004, to develop FPSs. The IPSs were reviewed and compared against monitoring results. Based on the monitoring results, each IPS was either modified or left the same (CH2M HILL, 2004a).

#### *Revegetation*

Revegetation continued in 2000 and 2001. Soil amendments, as described above, were applied to 371 acres in 2000, followed by hydroseeding. A second liming event was followed by application of soil amendments on 132 acres in 2001. The 2001 work represented the final large-scale revegetation operation on the hillsides. The remedial actions specific to herbaceous revegetation work across the hillsides are summarized in Table 4-7. Future vegetation activities will be limited to repair of existing plantings as needed and are expected to be smaller in scale.

**Table 4-7. Summary of Remedial Actions (Exclusive of Tree Planting) Conducted on the Bunker Hill Hillsides from 1998 through 2001**

| Gulch | East-Facing | | West-Facing | | North-Facing | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Acres | Percent[a] | Acres | Percent[a] | Acres | Percent[a] | Acres | Percent[a] |
| Deadwood | 120.7 | 11.1 | 110.3 | 10.1 | 0 | 0 | 231 | 21 |
| Government | 198.8 | 18.3 | 330.0 | 30.3 | 0 | 0 | 528.8 | 49 |
| Magnet | 0 | 0 | 0 | 0 | 107.3 | 9.9 | 107.3 | 10 |
| Grouse | 64.0 | 5.9 | 100.1 | 9.2 | 0 | 0 | 164 | 15 |
| Portal | 0 | 0 | 0 | 0 | 24.3 | 2.2 | 24.3 | 2 |
| Page | 0 | 0 | 33.1 | 3.0 | 0 | 0 | 33.1 | 3 |
| Total | 383.5 | 35.3 | 573.5 | 52.7 | 131.6 | 12.1 | 1,088.5 | 100 |

[a] Percent numbers refer to the percentages of a given gulch-aspect relative to the entire 1,088.5-acre project site.

In addition to application of soil amendments and large-scale hydroseeding efforts, the hillsides project also planted hardwood trees and shrubs. Reforestation activities began in the fall of 2001 and continued into the fall of 2002 with the goal of introducing additional ecosystem diversity and nutrients to the hillsides. Since mostly coniferous tree species were used historically in tree-planting programs, eight hardwood species, including alder, black locust, Rocky Mountain maple, redstem ceanothus, Wood's rose, serviceberry, and snowbrush ceanothus, were planted in the new hillsides effort. Of these species, four are capable of fixing nitrogen and further enriching soil nutrient levels. A total of 88,500 seedlings were planted on hillsides in scattered groupings. These groupings concentrate seedlings in discrete planting areas, with the expectation that each grouping will serve as a reservoir of seed in the future for natural species expansion.

Hydroseeded areas have been evaluated annually for percent cover and vigor beginning in 2000. Monitoring of tree planting areas occurred in 2003. Recent monitoring results are presented below. The project team will revisit those areas considered to be unsuccessful and make decisions regarding new design solutions if needed.

### *Monitoring of Hillsides Performance*

To ensure that the hillsides work meets the requirements of the 1992 OU2 ROD and overall project goals, a monitoring program began in 2000. The Hillsides Monitoring Program includes measures of surface water quality and vegetation (comprehensive reviews of this work are contained in CH2M HILL, 2001b, 2002b, 2003a, and 2004a). These are discussed below.

#### *Surface Water Quality Monitoring*

Water quality measurements serve as an indicator of overall site performance as it relates to watershed-level functions. Water quality demonstrates the effectiveness of vegetation cover and check dams in reducing transfer of sediments from the hillsides to streams. Water quality findings include:

- Monthly maximum and daily-average turbidity were lower in water year (WY) 2003, suggesting lower erosion rates.
- Summertime turbidity continues to decrease since WY 2000.
- In general, 2003 turbidity to storm volume was the lowest to date. However, this result is complicated by rainfall intensity differences among water years.
- Surface water quality from the hillsides met State of Idaho turbidity standards.
- Turbidity tended to rise above background in winter. This is hypothesized to occur when natural seasonal processes (such as freeze/thaw cycles and snowmelt runoff into the stream systems) increase turbidity downstream of the upstream background monitoring stations (which are located in higher elevations and are generally protected by a layer of snow).

Surface water quality monitoring has included total suspended solids (TSS), flow, and turbidity in the Deadwood and Government drainages. Measurement of these parameters in Grouse Gulch began in the fall of 2004.

The range of monthly maximum, daily-average turbidity at each site is shown in Table 4-8. Information specific to flow and TSS can be found in (CH2M HILL, 2004c).

*Vegetation Monitoring*

The revegetation activity was largely completed in 2001. Monitoring to date indicates progress towards successfully covering the hillside ground surfaces with vegetation sufficient to contribute to the goal of controlling erosion and increasing infiltration.

**Table 4-8. Range of Monthly Maximum, Daily-Average Turbidity in Hillsides Watersheds (NTU)**

| Station | WY2000 | WY2001 | WY2002 | WY2003 |
|---|---|---|---|---|
| Head of Government Gulch (control) | 1 to 50 | 1 to 20 | 1 to 18 | 1 to 10 |
| Mid-Government Gulch | 1 to 58 | 2 to 47 | 1 to 162 | 1 to 15 |
| Mouth of Government Gulch | 1 to 392 | 5 to 67 | 1 to 89 | 1 to 71 |
| Mouth of Deadwood Gulch | 2 to 361 | 9 to 73 | 2 to 308 | 1 to 96 |

NTU = nephelometric turbidity units
WY = water year

The specific results addressed below and in Table 4-9 indicate that hillsides vegetation is moving toward natural sustainability and stability. The adaptive management approach being implemented by the USEPA and the State of Idaho addresses potential issues, problems, or failures as they occur. Specific performance results are:

- Weighted average plant canopy cover of 65.8 percent. The majority of this cover is present as native bunch grass plant species and forbs, although non-native plants are also present in significant quantities.
- 80.3 percent of the landscape meets the plant cover performance goal of greater than 50 percent cover after 2 growing seasons. Much of the remaining landscape contains substrates with little opportunity for sustainable vegetation (rock surfaces, talus slopes, vertical cut slopes) and/or are too distant from stream systems to discharge sediment to them.
- Overall deciduous tree seedling survival equals 37.3 percent.
- Evidence of sustainable plant cover was observed in 100 percent of strip plots and 99 percent of fixed plots. This performance standard has been achieved.

**Table 4-9. Overall Plant Cover Class Distributions Found in 2003 Monitoring Work**

| Cover Class | Acres | Percent of Total |
|---|---|---|
| Class 1 – 0 to 24 percent | 53.0 | 4.9 |
| Class 2 – 25 to 49 percent | 161.0 | 14.8 |
| Class 3 – 50 to 74 percent | 461.4 | 42.4 |
| Class 4 – 75 to 100 percent | 412.7 | 37.9 |
| **Total** | 1088.6 | 100 |

Tree seedling survival was evaluated in 2003. Monitoring results indicated an overall survival rate of 37.3 percent. Serviceberry had the best survival and redstem ceanothus the worst. Lack of access limited follow-up care and is suspected of being a major contributor to the mortality observed on the hillsides, specifically inability to water the seedlings. Even though the mortality rate was high, this result represents 33,000 seedlings still surviving across the site, which, over time, is expected to enhance diversity, contribute to better site nutrition through nitrogen fixation, and eventually provide a seed source for expansion of these plants.

In addition, percent cover of vegetation was measured and the sustainability of that plant cover evaluated. These results are presented below. Areas that do not revegetate with current treatments will be further evaluated and treated if needed to protect human health and the environment.

### *Operations and Maintenance Considerations*

The Hillsides Monitoring Program guides short-term O&M. Hillsides revegetation and stabilization activities are evaluated annually and results are used to remedy any problems that might interfere with achievement of the goals and objectives. These have included strategic re-fertilization work and removal of noxious weeds.

Long-term hillsides O&M activities are limited at this time and include monitoring for surface erosion and repair of rills if needed, cleaning out ditches and culverts on roads near slopes, and inspecting check dams and making necessary repairs. Vegetation only needs to be replaced or repaired if erosion or mass movement disturbs it in a manner that could result in degradation of the human and/or natural environment. A web-based tool was developed that included all site characterization data mentioned above for use in long-term site management. A long-term O&M Plan is currently under development for the hillsides.

### *Controls on Access*

Access to the hillsides is no longer completely controlled. Access controls currently include gates across Government Gulch Road, Deadwood Gulch Road, and Grouse Gulch Road. Most of the time, the gate on Government Gulch Road is locked. However, the gates across both Deadwood and Grouse gulches are left open most of the time. Some access controls of McKinley Avenue, including guard stations and gates, are no longer in service during the day and the public can now gain access to the hillsides during the day. The McKinley Avenue gates are closed and locked at night. Less stringent control of access to the hillsides has resulted in increased use by off-road recreational vehicle riders. This has the potential to lead to new adverse environmental impacts to the vegetation and the watersheds as well as a potential human health exposure risk resulting from residual contamination that is known to exist in some areas of the hillsides. The public gains access to the hillsides during the weekend at least through Grouse Gulch where the gate remains open most of the time. Access also occurs via Pine Creek and Wardner.

### *Fencing*

The hillsides area is generally not fenced with the exception of a few hillside road crossings.

### *Wardner and Smelterville Slope Stabilization*

As mentioned in Section 3, the first five-year review for OU1 (USEPA, 2000b) identified sloughing of soil from contaminated hillsides onto adjacent remediated yards as an issue. The report recommended that wall construction or other best management practices be considered as well as appropriate planning and zoning changes to prevent development immediately adjacent to contaminated hillsides or modifications to hillsides that exacerbate erosion.

Since the first five-year review, the USEPA and the IDEQ have completed additional hillsides stabilization activities for residential yards adjacent to hillsides in the communities of Kellogg, Wardner, and Smelterville. Slope stabilization activities that were conducted from 2001 through 2004 outside of the residential yard program are identified in Section 4.3.14, Table 4-70 (Miscellaneous Box Projects).

Starting in early summer of 2005, the USEPA and the IDEQ will initiate the development of a strategic plan on slope stabilization for the remaining Wardner and Smelterville (including Silver King), residential properties that are adjacent to hillsides.

***Upper Industrial Landfill***

Solid waste material from the upper Industrial Landfill between Deadwood and Railroad Gulches (Figure 4-3) was removed in the late fall of 2000 and disposed in the Borrow Area Landfill (BAL). The area was regraded for erosion control and hand-seeded. No capping was necessary as all waste material was removed.

#### 4.3.1.4 Technical Assessment of Hillsides Remedial Actions

Per USEPA guidance (USEPA, 2001b), technical assessment was conducted by evaluating the following three questions related to protectiveness of the implemented remedial actions:

***Question A: Is the remedy functioning as intended by the decision documents?***

The hillsides remedy is functioning as intended by the decision documents. Specific aspects of the remedy performance evaluation are described below.

*Erosion Control Structures*

Check dam performance monitoring began in 2000 and continued through 2002 (CH2M HILL, 2001b and 2002b). Check dam performance is critical to achieving an overall site objective of eliminating contaminated sediment flowing into the SFCDR. Check dam performance has been acceptable over the monitoring period. Major findings include:

- Terrace straw-bale check dams are functioning as designed as an interim measure and, in conjunction with vegetation, are achieving the objectives of reducing flow and sediment transport on the terraces. As vegetation increases there will be less need for the straw-bale check dams
- Gully vegetation and straw-bale check dams are providing adequate soil stabilization and runoff energy dissipation.
- Ongoing maintenance has been needed to repair short-circuiting around a few log-pole and ecology-block check dams.
- Limited gully/terrace headcutting has occurred but not to a degree requiring gully work.

*Access Control*

This activity is ongoing and provides at least some means of controlling or limiting contact with contaminants in the area. However, access is available to off-road vehicles operated by the public at least during weekends and this access could lead to additional adverse impacts to the watersheds as well as a potential human health risk in those areas of the hillsides where residual contamination is known to exist.

*Fencing*

Fence maintenance is ongoing and provides some measure of controlling or limiting direct contact with any contaminants that may be present in those areas.

*Upper Industrial Landfill Area*

Erosion is occurring on the ditch line located at the northeast corner of the upper industrial landfill area near monitoring well BH-ILF-GW-0001. Underflow is occurring under the erosion control blanket covering the ditch line and depositing sediment at the end of the ditch near the monitoring well. The erosion control blanket and structures require repair. This item is considered routine O&M and will be addressed by the USACE as part of normal O&M.

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

The exposure assumptions, toxicity data, and cleanup levels used at the time of remedy selection remain valid for the hillsides remedial action.

Section 4.1.1 summarizes the ARARs review for the applicable OU2 decision documents. None of the new or revised standards identified in Section 4.1.1 are ARARs or potential ARARs for the hillsides remedial action. As discussed above, a fourth workshop was held in 2004 to evaluate the IPSs and determine where changes were needed. This workshop included representatives from the USEPA, the IDEQ, the BLM, and the USACE, and was led by CH2M HILL. The workshop examined each IPS (including the goals and objectives underlying each IPS) to determine whether, on the basis of existing monitoring information, the IPS was consistent with actual hillside performance. Modifications were made accordingly. CH2M HILL's Hillsides Technical Memorandum (CH2M HILL, 2004a) contains a matrix showing the IPSs, the proposed FPSs, and the rationale for the change. This workshop is part of the process whereby adaptive management is used for making decisions about short- and long-term management of these steep areas. By design, this process continually introduces and discusses new information about the performance of the hillsides in order to determine appropriate new approaches for maximizing remedy success. These modifications to the ISPs will be evaluated to determine if an ESD or ROD amendment is necessary to document changes to performance standards.

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

This five-year review did not find any new information that calls into question the protectiveness of the hillsides remedy.

***Remedy Issues***

Maintaining adequate site access control while the hillsides' vegetation is establishing itself is considered to be an issue. Currently, members of the off-road recreational community (both 4-wheelers and motorcycles) have started using the Silver Bowl and Government Gulch area for their activities. They appear to be gaining access at least through the generally unlocked Grouse Gulch gate and then moving over into Government and Grouse gulches. These recreational activities include vehicular movement across the contour and, most detrimentally, directly up and down the steep slopes. These activities are producing wheel ruts in many areas that could lead to the development of new gullies and new sources of sediment discharge to the watershed. Public meetings and/or better management of these activities and control of site access are recommended.

**Table 4-10. Summary of Hillsides Remedy Issues**

| Remedy Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **Hillsides Access Control:** Use of the hillsides by unsanctioned off-road vehicles may result in a potential human health risk from residual contamination and is producing wheel ruts that could lead to detrimental erosion. | N | Y |

### *Recommendations*

**Table 4-11. Summary of Hillsides Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Hillsides Access Controls:** Assess the need for additional access control to hillsides and gulches. Inform the public of the adverse impacts resulting from off-road use. | IDEQ, USEPA | IDEQ, USEPA | 9/2006 | N | Y |

## 4.3.2 Gulches

The seven gulches of primary concern cited in the 1992 OU2 ROD for remedial actions are from west to east (Figure 4-4):

- Grouse Gulch,
- Government Gulch,
- Magnet Gulch,
- Deadwood Gulch,
- Railroad Gulch,
- Portal Gulch, and
- Milo Gulch.

As noted above, the 1992 OU2 ROD and this five-year review distinguish between "hillsides" and "gulches." The gulches include the flat portions of the tributary gulches and not the sloping hillsides addressed in Section 4.3.1.

Portal and Milo gulches are discussed in sections 4.3.8 and 4.3.11, respectively, as their remedial actions are substantially different than the Phase I remedial actions conducted in

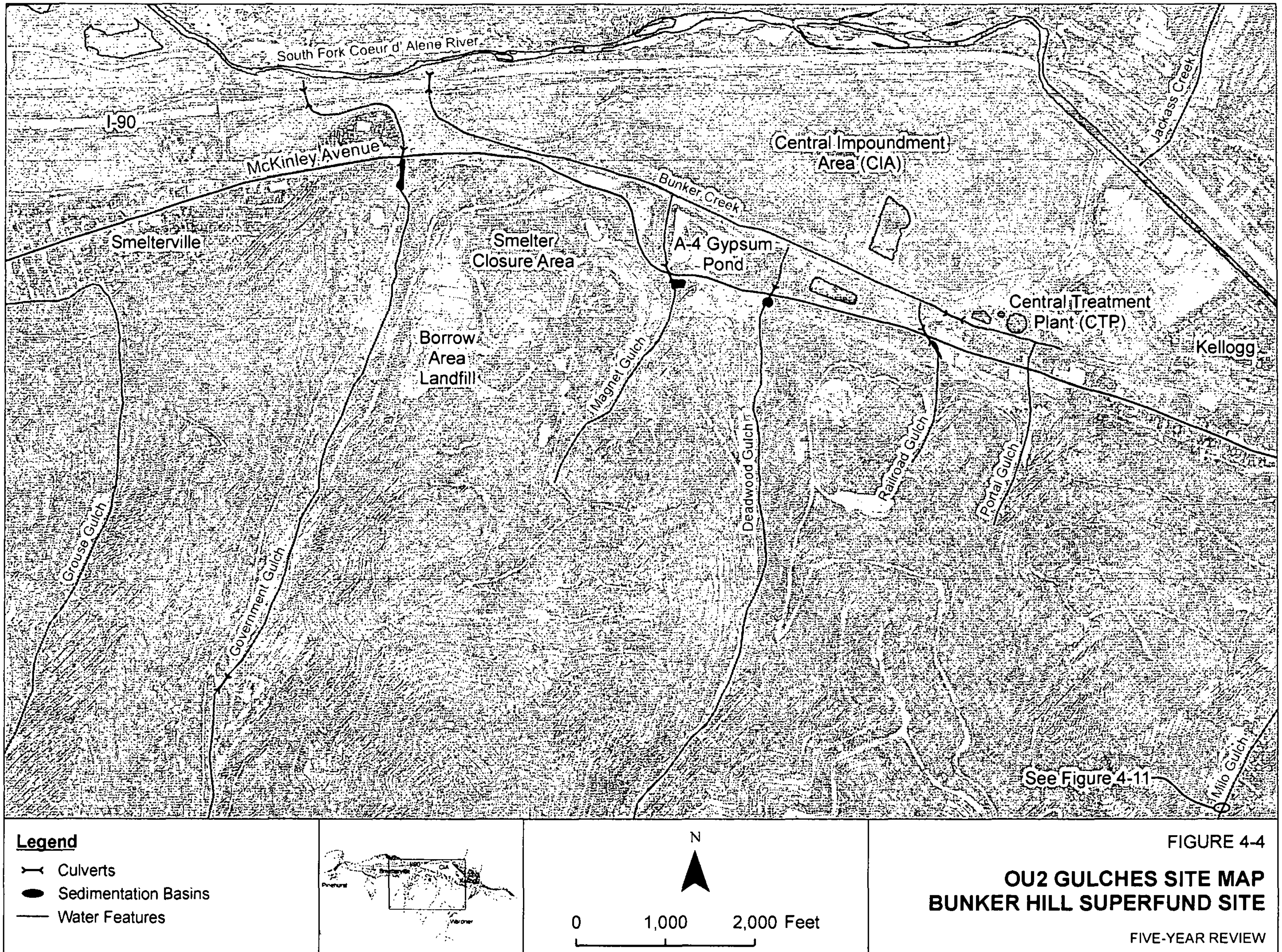


FIGURE 4-4

**OU2 GULCHES SITE MAP**
**BUNKER HILL SUPERFUND SITE**

FIVE-YEAR REVIEW

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the remainder of the gulches. For instance, the 1992 OU2 ROD-required actions for Portal Gulch, east of Railroad Gulch and south of the MOA, focus on mine water treatment from the Bunker Hill Mine, whose portal (Kellogg Tunnel) is located in Portal Gulch. Mine water pumped from the Bunker Hill Mine is conveyed to the CTP for treatment. See Section 4.3.8 for a discussion of the CTP and the treatment-related actions performed in the Portal Gulch area. The Milo Gulch remedial actions focus on major pipeline projects to convey creek and runoff flows and are addressed in Section 4.3.11.

#### 4.3.2.1 Review of ROD, ESD & ROD Amendment Requirements

Table 4-12 presents ROD and ROD amendment requirements that are common to all gulches within OU2 discussed in this section. ROD, ROD amendment, and ESD requirements that are specific to a gulch are presented in that gulches subsection below. As stated in Section 4.1, remedy implementation within OU2 is guided by the CCP which calls for a phased approach to remedy implementation. Currently, the majority of Phase I remedial actions within OU2 have been implemented. Therefore, the discussion and evaluation of the remedy to date is based on the Phase I remedial actions implemented and not the entire remedy.

**Table 4-12. ROD and ROD Amendment Remedial Actions Common to all Gulches**

| ROD Requirement | Remedial Action Objective/Goal |
|---|---|
| **1992 OU2 ROD** | |
| Enforce existing controls on access (Section 9.2.1) | Limit direct contact with contaminants |
| Maintain existing fencing (Section 9.2.1) | Limit direct contact with contaminants |
| Temporary dust control on material accumulation sites (Section 9.2.1) | Control migration of windblown dust |
| Re-establish riparian habitat and stream corridor vegetation, establish a vegetated stream corridor of 100 feet (Section 9.2.5) | Minimize erosion and contamination to tributaries and the SFCDR |
| Revegetate disturbed areas (Section 9.2.5) | Minimize erosion |
| Install barriers consistent with land-use in remaining areas (a minimum of 6" of clean soil or other barrier will be installed if surface concentrations >1000 mg/kg Pb) (Section 9.2.5) | Minimize direct contact with contaminants |
| Closure of mine rock dumps identified as posing a direct contact or erosion hazard (Section 9.2.6) | Minimize direct contact with contaminants and contaminant migration |
| Permanent dust control through containment, "hot spot" removal, soil/rock barriers and revegetation (Section 9.2.6) | Minimize contaminant migration and direct contact risk |
| **2001 OU2 ROD Amendment** | |
| Contaminated water collected at the site will be treated in the CTP | Provides an alternate treatment location to the collected water wetland |

#### 4.3.2.2 Gulch Soil Excavation Goals

As stated in Section 4.1.2 (Soil Excavation Goals), during the implementation of Phase I of the Selected Remedy for OU2, a chemical-specific soil excavation goal of 1,000 mg/kg lead was used for most OU2 source removal actions. One of the exceptions was for Government and Magnet gulches. The 1998 OU2 ESD provided separate upland (outside of the stream corridor) and streambed excavation goals for these gulches. Non-hillside upland areas with levels below the excavation goals (e.g., 10,000 mg/kg lead) but above 1,000 mg/kg lead received an ICP barrier consistent with future land use plans. For those areas that received an ICP soil cap, the clean backfill requirement was 100 mg/kg lead. Following excavation activities to remove contaminated soils that did not meet the removal performance standards of 1,000 mg/kg lead, streambeds and floodplains were reconstructed using geotextiles, soil, and rock compliant with ICP backfill requirements. In those areas of the streambed and floodplain where the performance standards were not attainable after repeated excavations, materials were removed to a minimum of 2 feet below the last excavation elevation and were backfilled with coarse rock compliant with the ICP backfill requirements (USEPA, 1998).

#### 4.3.2.3 Grouse Gulch

***Background and Phase I Remedial Actions Up to Year 2000***

Grouse Gulch is a small watershed located west of Government Gulch with a perennial creek (Grouse Creek) that passes through the Smelterville city limits. Following a major flood event in 1986, Shoshone County and the Soil Conservation Service constructed four gabion dams across the creek at various locations along its length in an attempt to stabilize the creek bed profile. Past smelting and mining activities resulted in surface contamination of the soils in the gulch area, including point sources of a mine dump, an abandoned tailings pile, and a discharging adit from the Blackhawk Mine, and a seep from the Wyoming Mine. These contamination sources and the unstable and eroding creek contributed to contaminated sediment being carried downstream, especially during high flow runoff events.

The 1992 OU2 ROD remedy for Grouse Gulch was not changed as a result of subsequent ROD Amendments or ESDs issued for OU2. The 1992 OU2 ROD remedial action is consistent with the goals and objectives of the Phase I remedy implementation and was conducted in 1997 using Bunker Limited Partnership (BLP) bankruptcy funds.

Table 4-13 presents the Phase I remedial actions conducted within Grouse Gulch. The goals of the Grouse Gulch remedial action were to minimize further contaminated sediment transport down the gulch and thereby reduce the potential for recontamination of previously remediated residential areas within the city of Smelterville and to minimize sediment load into downstream river systems.

| Table 4-13. Grouse Gulch Phase I Remedial Actions (as summarized in initial five-year review report) |
| --- |
| Approximately 1,200 cubic yards of tailings above the uppermost gabion structure were removed from locations closest to the creek and disposed in the CIA. |
| A new gabion dam was constructed in the lower reaches of the gulch to increase sediment retention time and to augment the sediment retention capacity of the existing gabion dam system in the gulch. |
| Sediment that had built up behind existing gabion dams was removed to provide more capacity for future runoff events. |
| The Wyoming mine dump located near the creek was buttressed at its base to minimize the potential for erosion into the creek. To increase its stability, approximately 2,000 cubic yards of mine dump material was removed and disposed at the CIA. |
| Accumulated sediment and alluvium was removed from downstream portions of the creek within the Smelterville city limits to increase the flow capacity within this portion of the creek and to minimize the potential for overtopping into remediated yards. |
| Access roads up through the gulch were improved to enable easier O&M of the gabion retention structures. |

### *Actions Since Last Five-Year Review*

The Grouse Gulch Phase I remedial action was fully implemented in 1997. Based on discussions with the USACE, the Grouse Gulch Phase I remedial action has not required any maintenance since the Phase I remedy was completed (Fink, 2004). The Shoshone County is responsible for cleaning out Grouse Gulch sediment basins to help control flooding in Smelterville associated with Grouse Creek.

### 4.3.2.4 Government Gulch

### *Background and Description of Phase I Remedial Actions*

Government Gulch is the historic location of several ore processing and acid/fertilizer producing facilities. Several wastewater ponds (typically unlined) and material stockpiles were also located on the floor of the gulch. Much of the subsurface soils were found to be highly contaminated to about 10 feet below ground surface, especially in the industrial parts of the gulch. Government Creek, which historically flowed down the center of the gulch in a meandering pattern, was modified during the time of active ore processing, and specifically in the area between the Zinc Plant and the Phosphoric Acid Plant. To provide space for the processing facilities, the creek was re-routed from the east side of the gulch above the Zinc Plant in pipes and open channels to a shot-creted open channel (which deteriorated significantly over time) located on the west side of the gulch below the Zinc Plant. As Government Creek flows north, it crosses under McKinley Avenue and eventually crosses under I-90 to discharge into the SFCDR. As part of the USEPA's 1990 AOC with Gulf Resources and Hecla Mining, sediment retention gabion dams were constructed in Government Creek to settle sediment from surface water.

Table 4-14 presents ROD, ROD amendment, and ESD requirements specific to Government Gulch in addition to those presented in Table 4-12. Table 4-15 presents the Phase I remedial actions implemented for Government Gulch prior to year 2000. As stated in Section 4.1, permanent remedial solutions (source removal and containment) were given preference over remedial actions focusing on conventional treatment methods that would result in a larger O&M cost burden after remedy implementation. The objective of the Government Gulch Phase I remedial action was to maximize the removal of contaminated source material from the gulch. The lining of Government Creek and groundwater cutoff walls were deferred until the benefits of increased source removals on Government Gulch surface water and groundwater could be fully evaluated. Government Gulch Phase I remedial actions resulted in the removal of approximately 400,000 cubic yards of contaminated material from the floor of Government Gulch.

**Table 4-14. ROD and ROD Amendment Remedial Actions Specific to Government Gulch**

| ROD Requirement | Remedial Action Objective/Goal |
|---|---|
| **1992 OU2 ROD** | |
| Erosion control structures and sediment basins (Section 9.2.1) | Reduction of suspended sediment/contaminant loading in surface runoff to the SFCDR |
| Channelize and line Government Creek (Section 9.2.1) | Prevent surface water from coming into contact with contaminated materials in the gulch bottom |
| Place cutoff wall and surface water diversion above Zinc Plant (Section 9.2.1) | Divert clean groundwater and surface water away from contaminated areas |
| Place cutoff wall and surface water diversion near mouth of Government Gulch (Section 9.2.1) | Collect contaminated groundwater and surface water for treatment in the collected water wetland |
| Contaminated materials and demolition debris from the Zinc Plant and Phosphoric Acid/Fertilizer Plant will be placed at the Zinc Plant location and capped with a 10-7 cm/sec cap (Section 9.2.1) | Consolidate contaminated materials under an impermeable cap to minimize contaminant migration to surface water and groundwater and eliminate direct contact |
| Phosphoric Acid/Fertilizer Plant warehouse will be decontaminated (Section 9.2.1) | Retain structure for future use |
| **1996 OU2 ESD** | |
| Placement of Zinc Plant and Phosphoric Acid/Fertilizer Plant demolition debris and contaminated material in the Smelter Closure Area | Consolidates contaminated material into a single facility and reduces the need to construct and maintain an additional closure in the Zinc Plant Area |
| Restoration of Government Creek to a natural drainage | Eliminates the need to channelize and line Government Creek |
| **1998 OU2 ESD** | |
| Phosphoric Acid/Fertilizer Plant warehouse demolished | Issues associated with the condition of the warehouse prevented its purchase by developers. Historic evidence suggested that the historic channel of Government Creek passed through this area, therefore, removal allowed for restoration of Government Creek to its historic channel |
| Zinc Plant Concentrate Handling and Warehouse buildings retained | At the request of Shoshone County, these structures were retained to be eventually conveyed to Shoshone County for use as maintenance facilities |
| Tall Stack demolition | As a result of deterioration of stack material and the cost associated with maintaining FAA required stack lighting systems, it was determined that demolition of the tall stacks would be more cost-effective than maintaining the structures |
| Excavation goals for areas away from Government Creek that will be capped with an ICP-approved cap modified | Contaminant Cleanup Goals for areas away from Government Creek: Lead – 10,000 mg/kg; Arsenic – 850 mg/kg; Zinc – 9,000 mg/kg; Antimony – 850 mg/kg; Mercury – 850 mg/kg; Cadmium – 850 mg/kg |
| Streambed excavation goals for Government Creek | Contaminant Cleanup Goals for Government Creek Streambed: Lead – 1,000 mg/kg; Arsenic – 850 mg/kg; Zinc – 1,000 mg/kg; Antimony – 850 mg/kg; Mercury – 850 mg/kg; Cadmium – 850 mg/kg |

| Table 4-14. ROD and ROD Amendment Remedial Actions Specific to Government Gulch | |
|---|---|
| **ROD Requirement** | **Remedial Action Objective/Goal** |
| **1992 OU2 ROD** | |
| **2001 OU2 ROD Amendment** | |
| Contaminated surface water and groundwater from Government Gulch will be treated in the upgraded CTP if treatment is determined to be necessary | Provides a location to treat contaminated water from Government Gulch in lieu of the collected water wetland |

| Table 4-15. Government Gulch Phase I Remedy Implementation Prior to Year 2000 |
|---|
| Nearly 400,000 cubic yards of contaminated materials (tailings, waste rock, and PTMs) were removed from the gulch extending from the upper reaches of Government Gulch down to McKinley Avenue. The entire gulch area received a 6-inch barrier cap of clean soil typical for future industrial use. |
| Government Creek was reconstructed from the upper reaches of the gulch up to approximately 2,000 feet south of McKinley Avenue. The low flow channel was typically rock-lined; the flood plain channel was vegetated. |
| Above ground structures associated with the Phosphoric Acid/Fertilizer Plant and Zinc Plant were demolished with the exception of the Zinc Plant Concentrate Handling Building and Warehouse. Salvageable materials were removed and recycled and the remainder of the demolition materials was placed in the Smelter Closure Area. |
| The tall stack at the Zinc Plant was demolished and debris was buried in place. |
| A 6-inch clean soil ICP barrier cap was placed outside the channel floodplain area. The entire gulch area was then hydroseeded, with the exception as noted above for the rock-lined low flow channel of Government Creek. Willows were planted in riparian areas of the creek. |

### *Actions Since Last Five-Year Review*

Since the initial five-year review in 2000, the last portion of Government Creek, from about 100 feet south of McKinley Avenue to I-90, has been reconstructed (Figure 4-4). This portion of the remedy included a culvert system beneath McKinley Avenue and a rock-lined creek channel adjacent to a light industry area of Smelterville, before entering into a culvert under I-90 for discharge into the SFCDR (Zion, 2004). The light industrial area (lumber mill) also received a 6-inch ICP cap. This remedial action was completed late in 2000.

Riparian corridor planting of applicable portions of Government Creek was conducted in 2001.

In the spring of 2003 a section of upper Government Creek required maintenance and channel rebuilding efforts after runoff and creek flows eroded the channel that was completed in 1998. The repairs were performed in an approximately 800-lineal-foot section of the channel starting at the existing gabion structure and working downstream (Figure 4-4). The USACE rebuilt this portion of the creek by removing smaller bed-load rock, recontouring, armoring, and revegetating intermittent sections of the eroded channel. In 2006, the USACE will re-cap discrete areas in Government Gulch (greater than 1,000 mg/kg lead) that were recontaminated during the 2003 channel repair work described above.

### 4.3.2.5 Upper Magnet Gulch

***Background and Remedial Actions Up to Year 2000***

Magnet Gulch, located to the east of Government Gulch, was used for various material storage and handling processes. Much of Magnet Gulch was filled to construct the A-1 gypsum pond, a railroad embankment and materials storage area. The lower portion of Magnet Gulch was filled by the A-4 gypsum pond, discussed in Section 4.3.12. In the portion of Magnet Gulch immediately south of McKinley Avenue, approximately 20,000 tons of copper dross flue dust was stockpiled. This material contained significant amounts of lead, arsenic, zinc, and indium and was designated as a PTM during the OU2 RI/FS phase. Magnet Creek stabilization work, primarily a sediment retention gabion dam, was constructed in 1992 as part of the USEPA's 1990 AOC with Gulf Resources and the Hecla Mining Company.

Much of the native vegetation in Magnet Gulch and surrounding hillsides was significantly adversely impacted by smelter emissions resulting in substantial surface erosion within the gulch (MFG, 1992b).

Table 4-16 presents ROD, ROD amendment, and ESD requirements specific to upper Magnet Gulch in addition to those presented in Table 4-12. Table 4-17 presents Phase I remedial actions that have been conducted within upper Magnet Gulch prior to year 2000. The Phase I remedial actions for upper Magnet Gulch did not differ from the remedial actions identified in the 1992 OU2 ROD.

**Table 4-16. ROD and ROD Amendment Remedial Actions Specific to Upper Magnet Gulch**

| ROD Requirement | Remedial Action Objective/Goal |
|---|---|
| **1992 OU2 ROD** | |
| Erosion control structures and sediment basins | Reduction of suspended sediment/contaminant loading in surface runoff to the SFCDR |
| Relocate A-1 Gypsum Pond to CIA | Limit direct contact with contaminant and control migration of contaminants to surface water and groundwater. Minimize infiltration through gypsum materials |
| **1996 OU2 ESD** | |
| Relocation of a portion of the A-1 Gypsum Pond material to the Lead Smelter Closure Area | Reduce haul distance required for disposal of gypsum materials |
| **1998 OU2 ESD** | |
| Excavation goals for areas away from upper Magnet Creek that will be capped with an ICP-approved cap modified | Contaminant Cleanup Goals for areas away from upper Magnet Creek: Lead – 10,000 mg/kg; Arsenic – 850 mg/kg; Zinc – 9,000 mg/kg; Antimony – 850 mg/kg; Mercury – 850 mg/kg; Cadmium – 850 mg/kg |
| Streambed excavation goals for upper Magnet Creek | Contaminant Cleanup Goals for upper Magnet Creek Streambed: Lead – 1,000 mg/kg; Arsenic – 850 mg/kg; Zinc – 1,000 mg/kg; Antimony – 850 mg/kg; Mercury – 850 mg/kg; Cadmium – 850 mg/kg |

| Table 4-17. Upper Magnet Gulch Phase I Remedial Actions Prior to Year 2000 |
|---|
| In 1992, Gulf Resources relocated the copper dross flue dust pile from Magnet Gulch to another temporary storage site adjacent to the Lead Smelter. The pile was placed on a concrete slab to prevent contamination of the ground surface and was tarped to prevent air-borne dispersion. |
| Removal of the A-1 Gypsum Pond to the CIA and Smelter Closure Area. |
| Removal of mid-Gulch fill materials. Approximately 200,000 cubic yards of material were removed. In addition, the box culvert that the mining companies had constructed beneath the mid-gulch fill to carry the flows of Magnet Creek was located and removed. |
| Reconstruction and revegetation of Magnet Creek. In 1999, the portion of Magnet Creek above McKinley Avenue was reconstructed on native material and three sediment retention basins were constructed along the creek's alignment to slow down water flow. The channel and banks were rock-lined to minimize erosion. Magnet Gulch was hydroseeded upon completion of the channel work. |

### *Actions Since Last Five-Year Review*

The upper Magnet Gulch Phase I remedial action was fully implemented in 1999.

The USACE routinely inspects all completed remedial actions at the site. Since completion, upper Magnet Gulch has required no maintenance to maintain the integrity of the action.

### 4.3.2.6 Deadwood Gulch

### *Background and Remedial Actions Up to Year 2000*

Deadwood Gulch is located immediately east of Magnet Gulch. As Deadwood Creek leaves the gulch area, it flows beneath McKinley Avenue between the eastern edge of the A-4 Gypsum Pond and the CTP's Lined Pond prior to discharging to Bunker Creek. The Arizona Mine dump filled the narrow valley of Deadwood Gulch in its upper reaches, and various mine adits/portals surfaced in Deadwood Gulch that occasionally discharged. Other than these point sources of contamination, Deadwood Gulch contamination was primarily from the erosion of adjacent hillside soils that had become contaminated with smelter emissions and the Sierra Nevada Mine Dump. The Arizona Mine Dump that blocked the upper reaches of Deadwood Creek also resulted in significant quantities of gravel and rock bed-load being transported downstream during run-off events.

In the early 1990s, Pintlar (a subsidiary of Gulf Resources, OU2's primary PRP) built two gabion dams across Deadwood Creek for sediment retention. The intent of these sediment dams was to slow down flow during spring run-off such that sediment could be retained within the gulch rather than flowing into downstream water systems. In the spring of 1995, the northernmost gabion dam was overtopped and damaged by run-off flows. The cause of the over-topping (a sediment-clogged geotextile on the upstream face of the dam) was subsequently removed so that flow can not build up behind the dam in excess of its design assumptions. This dam and the other Deadwood Gulch gabion dam are performing adequately and are routinely inspected after major storms and during annual inspections.

Table 4-18 presents 1992 OU2 ROD requirements specific to Deadwood Gulch not included in Table 4-12. Table 4-19 presents the Phase I remedial actions conducted in Deadwood Gulch prior to year 2000.

| Table 4-18. 1992 OU2 ROD Remedial Actions Specific to Deadwood Gulch | |
|---|---|
| **ROD Requirement** | **Remedial Action Objective/Goal** |
| **1992 OU2 ROD** | |
| Erosion control structures and sediment basins | Reduction of suspended sediment/contaminant loading in surface runoff to the SFCDR |
| Closure of mine rock dumps identified as posing a direct contact or erosion hazard | Minimize direct contact with contaminants and contaminant migration |

| Table 4-19. Deadwood Gulch Phase I Remedial Actions Prior to Year 2000 |
|---|
| Sediment that had collected behind the gabion dam retention structures was removed. The sediment was tested for contaminant levels and was found to be below cleanup goals enabling the sediment to be spread out along areas outside the creek bed and then hydroseeded. |
| Creek stabilization work consisted of constructing small cobble and boulder grade check dams perpendicular to the creek flow about every 200 to 300 feet. |
| The Arizona Mine Dump was removed and hauled to the CIA for disposal. Approximately 500,000 cubic yards of material was removed and the streambed was reconstructed in the previously blocked portion of Deadwood Gulch. |
| Lower Deadwood Creek from the first gabion down to a sedimentation basin just south of McKinley Avenue was reconstructed. New culverts were installed under McKinley Avenue and a heavy riprap channel was constructed from the north side of the McKinley Avenue culvert down to Bunker Creek. |

### *Actions Since Last Five-Year Review*

This remedial action was conducted beginning in 1995 and was essentially complete in 1998 with the exception of riparian planting. Riparian corridor planting of the Deadwood Creek was conducted in 2001.

The USACE routinely inspects all completed remedial actions at the Site. Since completion, Deadwood Gulch has required no maintenance to maintain the integrity of the action.

### 4.3.2.7 Railroad Gulch

### *Background and Remedial Actions Up to Year 2000*

Railroad Gulch is east of Deadwood Gulch and south of the Boulevard Area, a small strip of land adjacent to the south side of McKinley Avenue. Flows from Railroad Gulch cross the eastern end of the Boulevard, cross under McKinley Avenue in a culvert, and discharge into Bunker Creek. The lower portion of the creek channel was undersized and routinely flooded during high-flow spring run-off onto the Boulevard Area (a flat area that historically stored piles of highly concentrated ore material, "concentrates"). This localized flooding spread contamination that existed in the Boulevard Area. Erosion of the channel also occurred during high run-off owing to the steep channel gradient between McKinley Avenue and Bunker Creek.

To address the flooding and erosion damage concerns of the Railroad Gulch channel, the remedial actions presented in Table 4-20 were conducted as part of the Phase I remedy:

| Table 4-20. Railroad Gulch Phase I Remedial Actions Prior to Year 2000 |
|---|
| The portion of the Railroad Gulch surface water channel that extends across the eastern end of the Boulevard Area, crosses under McKinley Avenue, and then connects to Bunker Creek was reconstructed to increase flow capacity. The channel was lined with riprap. A sedimentation basin was constructed south of McKinley Avenue. |
| Culverts beneath McKinley Avenue were increased in size to handle the estimated spring run-off flows. |
| Areas adjacent to the channel that were disturbed during construction capped with at least 6-inches of clean fill and were revegetated. |

### *Actions Since Last Five-Year Review*

The Railroad Gulch Phase I remedial action was fully implemented in 1997.

The USACE routinely inspects all completed remedial actions at the Site. Since completion, Railroad Gulch has required no maintenance to maintain the integrity of the action.

## 4.3.2.8 Technical Assessment of Gulch Remedial Actions

Per USEPA guidance (USEPA, 2001b), technical assessment was conducted by evaluating the following three questions related to protectiveness of the implemented remedial actions:

### *Question A: Is the remedy functioning as intended by the decision documents?*

The gulch remedial actions are functioning as intended by the decision documents. Specific aspects of the remedy performance evaluation are described below.

When the initial five-year review report was prepared in 2000, the Phase I gulch remedial actions had only been in place for 1 to 2 years. At that time, it was premature to evaluate whether remedy performance had been achieved, especially related to improvements in surface water and groundwater. Currently, groundwater and surface water within the gulches is being evaluated to determine the potential impacts of the Phase I remedial actions on water quality. This evaluation includes the evaluation of water quality with respect to ARARs for OU2 and the evaluation of trends in contaminant metals and associated field parameters since the Phase I remedial actions were implemented. The status of ecological receptors is being monitored and preliminary results of the biological monitoring are presented in Section 4.4.3.

The 1992 OU2 ROD performance objectives for the gulches are to:

- Limit direct contact with contaminated material;
- Reduce erosion and suspended sediment in surface water tributaries of the SFCDR; and
- Reduce contamination to surface and groundwater.

This section of this second five-year review report addresses the performance of the gulch remedies related to limiting direct contact and reducing erosion and suspended sediment. Reduction of contamination to surface water and groundwater will be addressed after completion of the evaluation of OU2 water quality data is completed.

Phase I remedy performance for the gulch actions can be judged based on whether the remedy satisfies the following intent of the ROD, its amendment, and ESD documents:

- Stable non-eroding surface water channels;
- Contaminated soil either capped or removed such that migration to surface and groundwater is substantially minimized; and
- Vegetation reestablished sufficiently such that surface water runoff will not erode caps.

For this five-year review, Phase I remedy performance for the gulches was evaluated by conducting site inspections, reviewing O&M conducted from 2000 through 2004, checking that remaining work as identified in the 2000 initial five-year report had been completed, and by reviewing applicable monitoring data.

**Grouse Gulch.** The Grouse Gulch remedial action has been in place for 8 years. The first five-year review report for OU2 identified no work remaining and no issues associated with the Phase I remedy. The inspection conducted as part of this second five-year review also indicated that there were no issues related to the Phase I remedy as implemented. Currently an evaluation of surface water quality data for Grouse Gulch is being conducted to determine the effectiveness of the Phase I remedy with respect to water quality goals. As stated earlier, the Shoshone County is responsible for cleaning out Grouse Gulch sediment basins to help control flooding in Smelterville associated with Grouse Creek.

**Government Gulch.** The Government Gulch Phase I remedial action has been in place for about 7 years. The first five-year review report for OU2 identified no issues with the Phase I remedy. Two remaining components of work for the Government Gulch Phase I remedy were identified:

- Reconstruction of the lower Government Creek corridor; and
- Riparian planting.

Both of these remaining components of work have been completed since the initial five-year review in 2000. As mentioned previously, in 2006 the USACE will re-cap discrete areas in Government Gulch (greater than 1,000 mg/kg lead) that were recontaminated during the 2003 channel repair work described above.

The site inspection conducted as part of this second five-year review indicated that the creek channel was stable, riparian plantings had taken hold along the creek corridor providing additional bank stabilization, and vegetation of capped areas was well established and providing a non-erosive surface for the underlying 6-inch ICP cap. Creek flow turbidity measurements were obtained for Government Creek as part of the monitoring program for the effectiveness of the hillsides remedial actions. These data are reported and discussed in Section 4.3.1 and indicate that the combination of vegetative cover and check dams are reducing turbidity in the creek.

Based on the site inspection and data trends showing decreases in sediment load in the Government Creek, this five-year report documents that no issues currently exist with the performance of the Phase I Government Gulch remedy.

Currently, an evaluation of surface water and groundwater quality within Government Gulch is being conducted to determine the effectiveness of the Phase I remedy with respect to water quality goals. Biological monitoring to evaluate the status of ecological receptors within Government Gulch is ongoing and summary results are presented in Section 4.4.3.

**Upper Magnet Gulch.** The Upper Magnet Gulch Phase I remedial action has been in place for about 6 years. The first five-year review report for OU2 identified no work remaining and no issues with the Phase I remedy. No O&M has been necessary for the upper Magnet Gulch Phase I remedy since it was completed (Fink, 2004).

The site inspection conducted as part of this second five-year review indicated that the Magnet Creek channels are stable and revegetation in the gulch is re-establishing and minimizing erosion.

Based on the site inspection and lack of O&M needed for this remedial action, this documents that no issues currently exist with the performance of the Magnet Gulch Phase I remedy.

Currently, an evaluation of surface water quality in upper Magnet Gulch is being conducted to determine the effectiveness of the Phase I remedy with respect to water quality goals. Biological monitoring to evaluate the status of ecological receptors within Magnet Gulch is ongoing and summary results are presented in Section 4.4.3.

**Deadwood Gulch.** The Deadwood Gulch Phase I remedial action has been in place for about 8 years. The first five-year review report for OU2 identified riparian planting as the work remaining and noted that there were no issues with the overall Phase I remedy. As noted above, riparian planting for Deadwood Gulch was conducted in 2001. No O&M has been necessary for the Deadwood Gulch Phase I remedy since it was completed (Fink, 2004).

The site inspection conducted as part of this second five-year review indicated that the Deadwood Gulch creek channels are stable and revegetation in the gulch is established and minimizing erosion. The gabion dam structures in Deadwood channel are performing as designed. In addition, creek flow turbidity measurements have been collected at the mouth of Deadwood Gulch as part of evaluating the effectiveness of hillside remedial actions. These data are reported and discussed in Section 4.3.1 and indicate that the vegetation and check dams are resulting in decreases in the sediment load to the creek.

Based on the site inspection and data trends showing decreases in sediment load in the Deadwood Creek, this five-year review report documents that no issues currently exist with the performance of the Deadwood Gulch Phase I remedy.

Currently an evaluation of surface water and groundwater quality data within Deadwood Gulch is being conducted to determine the effectiveness of the Phase I remedy with respect to water quality goals. Biological monitoring to evaluate the status of ecological receptors within Deadwood Gulch is ongoing and summary results are presented in Section 4.4.3.

**Railroad Gulch.** The Railroad Gulch remedial action has been in place for about 6 years. The first five-year review report for OU2 identified no work remaining and no issues with the Phase I remedy. No O&M has been necessary for the Railroad Gulch Phase I remedy since it was completed (Fink, 2004).

The site inspection conducted as part of this second five-year review indicated that the Railroad Gulch creek channel is stable and revegetation in the gulch is established and minimizing erosion. The sedimentation basin south of McKinley Avenue is functioning as designed with minimal sediment buildup noted at the time of inspection. Culverts crossing under McKinley were free of debris and sediment buildup.

This five-year review report documents that no issues currently exist with the performance of the Railroad Gulch Phase I remedy.

### *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?*

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the various gulch remedial actions.

Section 4.1.1 summarizes the ARARs review for the applicable OU2 decision documents. None of the new or revised standards identified in Section 4.1.1 call into question the protectiveness of the Phase I gulch remedies.

### *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

This five-year review did not find any new information that calls into question the protectiveness of the Phase I gulch remedial actions. As stated above, an evaluation of surface water and groundwater quality data is being conducted within OU2 to determine the effectiveness of the Phase I remedy. Results from recent biological resources sampling are also being considered as part of this evaluation.

Phase II will consider any shortcomings encountered in implementing Phase I and will specifically address long-term water quality and environmental management issues. Although the 1992 OU2 ROD goals did not include protection of ecological receptors, additional actions may be considered within the context of site-wide ecological cleanup goals as part of the Phase I remedy evaluation and consideration of a Phase II remedy.

### *Remedy Issues*

**Table 4-21. Summary of Gulches Remedy Issues**

| Remedy Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **Biological Monitoring:** Elevated metals concentrations were observed in Deadwood, Government, and Magnet Gulches during biomonitoring. | N | Y |

### *Recommendations*

**Table 4-22. Summary of Gulches Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Biological Monitoring:** Conduct additional soil sampling for metals concentrations in areas where biomonitoring is occurring. | USFWS | USEPA | 10/2006 | N | Y |

| Table 4-22. Summary of Gulches Recommendations and Follow-Up Actions | | | | | |
|---|---|---|---|---|---|
| | | | | Follow-up Actions: Affects Protectiveness (Y/N) | |
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Current (now to 1 year) | Future (>1 year) |
| **Gulch Phase 1 Remedial Action Effectiveness Monitoring:** Complete evaluation of the Phase I remedial action effectiveness monitoring data and revise the remedial action effectiveness monitoring plan as appropriate. | IDEQ, USEPA | IDEQ, USEPA | 7/2006 | N | Y |

## 4.3.3 Smelterville Flats

The boundaries of the Smelterville Flats area are the northern bank of the SFCDR floodplain, Pinehurst Narrows to the west, the town of Smelterville on the south, and the I-90 West Kellogg interchange on the east (Figure 4-5). The Shoshone County Airport and runway are located in the Flats area north of I-90.

In response to complaints from agricultural interests downstream, mining companies in the Silver Valley constructed a series of plank and pile dams upstream of OU2, and one large plank and pile dam in the Pinehurst Narrows area in 1910. The plank and pile dam impounded tailings in the SFCDR floodplain in the Smelterville Flats area from OU2 and upstream sources. In 1926, construction of the Page Pond tailings impoundment began, followed in 1928 by the CIA to act as tailings impoundments for Page and Bunker Hill Mine concentrators and mines, ending direct discharge of tailings and mine wastes from OU2 sources directly to the SFCDR. Upstream mines and mills continued to discharge tailings directly to the SFCDR and its tributaries until 1968. In 1933, flooding resulted in the failure of the plank and pile dam at Pinehurst Narrows. Tailings and other mine wastes from Bunker Hill and upstream sources that had been impounded behind the plank and pile dam were redistributed downstream and reworked into the SFCDR floodplain and stream channel within OU2.

### 4.3.3.1 Review of ROD, ESD & ROD Amendment Requirements

Table 4-23 presents the remedial actions required by the 1992 OU2 ROD, the 1998 OU2 ESD, and the 2001 OU2 ROD amendment for Smelterville Flats.

| Table 4-23. Smelterville Flats Remedial Actions Required | |
|---|---|
| ROD and ESD Requirements | Remedial Action Objective/Goal |
| **1992 OU2 ROD** | |
| Rock/vegetation barriers on truck stop and RV park (Section 9.2.2) | Minimize direct contact |
| Temporary dust control during remediations; revegetate as part of long-term solution (Section 9.2.2) | Minimize surface water erosion and wind dispersion of contaminants |
| Soil or rock barriers on exposed contaminated soils and tailings that cannot be revegetated (Section 9.2.2) | Minimize direct contact |
| Remove tailings as necessary for natural wetland and floodway construction (Section 9.2.2) | Control migration of contaminants to surface and groundwater, minimize the potential need |

Table 4-23. Smelterville Flats Remedial Actions Required

| ROD and ESD Requirements | Remedial Action Objective/Goal |
|---|---|
| | for future water treatment |
| Construct groundwater treatment wetland system upstream of Pinehurst Narrows (Section 9.2.2) | Control migration of contaminants to surface and groundwater |
| Construct collected water wetland treatment system (Section 9.2.2) | Treatment of specific surface waters collected at the site, reduction of contaminants to SFCDR |
| Construct floodway for SFCDR (Section 9.2.2) | Minimize surface water erosion and sedimentation |
| **1998 OU2 ESD** | |
| Treatment Wetlands, if constructed will most likely be located in an area different from Smelterville Flats | Treatment of specific surface waters collected at the site, reduction of contaminants to SFCDR |
| Runoff controls will be constructed south of I-90 in areas expected to be developed and paved | Minimize infiltration and percolation into underlying contaminants |
| **2001 OU2 ROD Amendment** | |
| Treatment of select site waters originally slated for the wetland treatment systems will occur at the CTP | Provides an alternate location for water treatment |

### 4.3.3.2 Smelterville Flats Soil Excavation Goals

The removal goal for Smelterville Flats south of I-90 was 1,000 mg/kg lead. The site-specific removal goals for Smelterville Flats north of I-90 were 3,000 mg/kg lead and 3,000 mg/kg zinc. These removal goals were limited by a number of constraints such as dewatering limits, physical barriers (e.g., large woody vegetation next to the river), visual observations of alluvial material, and concentrations found in the sediments typical of the SFCDR. Although a significant volume (1.2 million cubic yards) of tailings was removed from the Flats north of I-90, a complete removal was not necessary in order to achieve RAOs. The areas that were excavated, and most of the areas where contamination remained and where material was too coarse to support vegetation, were capped or constructed with clean materials (less than 100 mg/kg lead); topsoil was placed in the upland and flood plain areas and clean rock in the primary river channel construction areas.

### 4.3.3.3 Background and Remedial Actions Up to Year 2000

Table 4-24 summarizes the remediation activities conducted in the Flats from 1996 to 1998 as reported in the first five-year review report for OU2 (USEPA, 2000a).

| Table 4-24. Smelterville Flats Phase I Remedial Actions Prior to Year 2000 (as summarized in the initial five-year review report) |
|---|
| The truck stop and RV park are outside of the area defined as Smelterville flats above, but were required to receive a remedy in accordance with the 1992 OU2 ROD. These two areas are located north of the SFCDR and east of the Theatre Bridge (Figure 4-1) and were capped in the early 1990s. In 1996 to 1997, additional clean material was placed on the RV park (Chavez, 2000). Re-capping of the truck stop area was partially accomplished with a 6-inch layer of topsoil placed over the portion of the property owned by the truck stop. Additional capping consisted of asphalt and shoulder gravel. |
| The USEPA and the State removed tailings from the SFCDR floodplain in 1997 and 1998. The 'Emerald Pond' area just west of Theatre Bridge was one of the first completed areas of tailings removal and reconstruction. Grasses and forbs were hydroseeded throughout the Flats area to begin establishment of herbaceous cover. |
| Tailings were extensively removed in Smelterville Flats north of I-90. The site-specific removal goals for this |

| Table 4-24. Smelterville Flats Phase I Remedial Actions Prior to Year 2000 (as summarized in the initial five-year review report) |
|---|
| area were 3,000 mg/kg lead and 3,000 mg/kg zinc. These removal goals were limited by a number of constraints such as dewatering limits, physical barriers (e.g. large woody vegetation next to the river), visual observations of alluvial material, and concentrations found in the sediments typical of the SFCDR. Although a significant volume (1.2 million cubic yards) of tailings was removed from the Flats north of I-90, a complete removal was not necessary in order to achieve RAOs. The areas that were excavated, and most of the areas where contamination remained and where material was too coarse to support vegetation, were capped or constructed with clean materials (<100 mg/kg lead), i.e., 6 to 8 inches of topsoil in the upland and flood plain areas and clean rock in the primary river channel construction areas. The tailings removed within the Flats area north of I-90 were transported to the CIA for disposal. The larger-scale removal is expected to result in less migration of contaminated sediment to surface water and groundwater in the Flats area. Capping and revegetation was done to prevent direct contact with underlying contaminants by humans and animals and to stabilize the floodplain and minimize erosion. Performance monitoring continues to determine the effects of this larger-scale removal action in relation to water quality improvement at the site. |
| All areas surrounding the SFCDR upper bank and throughout much of the reconstructed floodplain were hydroseeded. |
| Surface soil or rock barriers, particularly in the East of Theatre Bridge area of the SFCDR, were placed in lieu of complete removals. |
| Floodway work for the SFCDR to improve groundwater and surface water quality consisted of:<br>• Grading back the riverbanks<br>• Armoring the lower bank with riprap<br>• Creating a flatter sloped upper bank protected with a combination of riprap, growth media, and live branch plantings<br>• Construction of spillways and sills in the river channel<br>• Construction of low flow channels and overflow channel in the floodplain<br>• Reseeding native, organically enriched topsoils across much of the Flats |
| Tailings were also removed south of I-90 and were hauled to the CIA for disposal. The removal goal was 1,000 mg/kg lead. The south of I-90 removal areas were regraded for drainage purposes, and clean borrow soil from the Borrow Area was placed to bring the excavations to a suitable grade for long-term drainage The remediated areas were revegetated to protect the surface cap and to minimize erosion. |

#### 4.3.3.4 Actions Since Last Five-Year Review

Since the initial five-year report was published in September 2000, the following additional work has been conducted as part of the Smelterville Flats Phase I remedy:

- **North of I-90 Smelterville Flats:** Riparian plantings of trees and shrubs were installed during late 2000 and 2001. Noxious weed control programs have been conducted in the north of I-90 Flats area periodically from 2001 through 2004 by the USACE.

- **South of I-90 Flats area:** Improvements to surface water runoff control were implemented in 2001. These improvements consisted of a vegetated swale and storm drain pipe parallel to I-90 from about the Smelterville highway interchange west approximately 6,500 feet to a sedimentation pond in the West End removal area (see Figure 4-5).

- **S&P Truck Stop Area:** The PRP re-capped this area in 2001; however, when the waste rock used for the cap was found to be contaminated, the USACE re-capped the area in the summer of 2001 with a minimum 6-inch rock layer to prevent contact with underlying contaminated soils and to prevent dust. In addition, an asphalt cap was constructed in the fueling and turn-around areas to prevent re-exposure of underlying

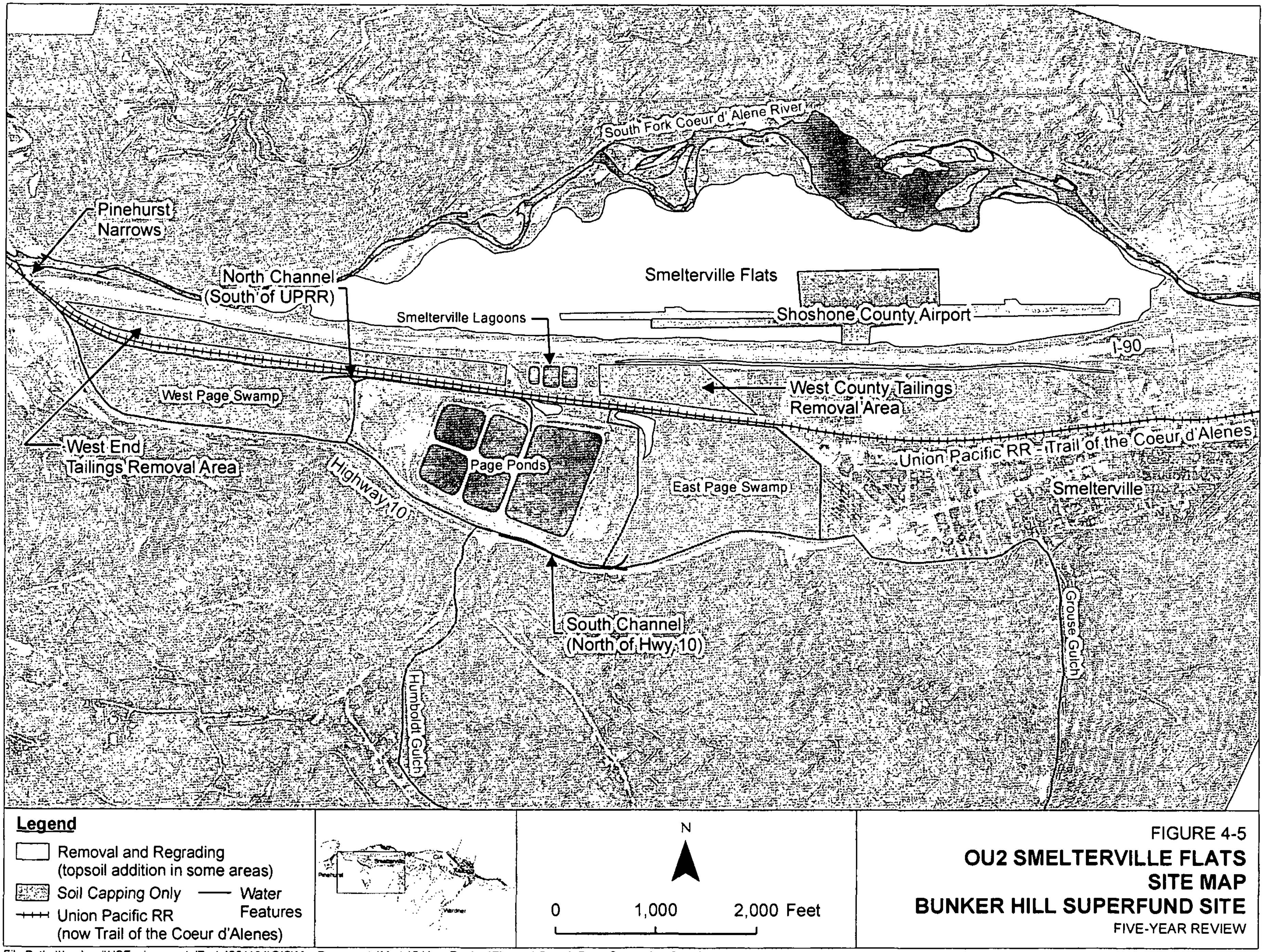



FIGURE 4-5
**OU2 SMELTERVILLE FLATS SITE MAP**
**BUNKER HILL SUPERFUND SITE**
FIVE-YEAR REVIEW

File Path: \\boo\proj\USEnvironmentalProte\321104\GIS\MapDocuments\Mxds\5-Year Review\Figure 4-5.mxd, Date: September 28, 2005 11:00:18 AM contaminated soils in these high traffic areas. This item of work was identified as a deficiency in the initial five-year review report. See Section 4.3.14 (Miscellaneous Box Projects), Table 4-70 for a more detailed description of this work.

#### 4.3.3.5 Technical Assessment of Remedial Actions

Per USEPA guidance (USEPA, 2001b), technical assessment was conducted by evaluating the following three questions related to protectiveness of the implemented remedial actions:

***Question A: Is the remedy functioning as intended by the decision documents?***

The Smelterville Flats Phase I remedy is functioning as intended by the decision documents. Specific aspects of the remedy performance evaluation are described below.

As summarized in Table 4-23, the remedial objectives of the Smelterville Flats Phase I remedy are to:

- Minimize direct contact with contaminated material;
- Minimize surface water erosion and wind dispersion of contaminants;
- Minimize migration of contaminants to surface and groundwater; and
- Minimize surface water infiltration into the underlying contaminants.

Most of the Smelterville Flats Phase I remedy was complete in 1998. The remaining work items identified in the first five-year review report for OU2 (planting, re-capping of the S&P truck-stop area, and installing a drainage system) were completed between 2000 and 2001 as noted above. The only deficiency noted in the initial five-year review report was the re-capping effort at the S&P truck-stop, which has been addressed. In 2005, the USACE capped four discrete areas with elevated levels of lead south of I-90 and east of the Smelterville Ponds.

Remedy performance of the Smelterville Flats Phase I remedy was evaluated by inspecting the various remedial components that were put in-place to achieve the objectives cited above, namely:

- Soil caps and revegetation. Stable soil caps and vegetation minimize direct contact with contaminants, surface water erosion and wind dispersion of contaminants, and surface water infiltration into underlying contaminants.

- Reconstructed streambanks. Stable streambanks minimize surface water erosion and migration of contaminants to surface water and groundwater.

Based on the above objectives, the five-year inspection of the Smelterville Flats Phase I remedy focused on the stability of soil caps and reconstructed streambanks and the health of the revegetation efforts.

The site inspection conducted as part of this five-year review report indicated that the capped areas of Smelterville Flats are stable and provide effective barriers for underlying contaminated material. The vegetation at the Flats was lush and has been regenerating yearly without maintenance efforts. Noxious weed control programs were periodically conducted in the Flats in an effort to control specific weeds. The reconstructed streambanks of the SFCDR in the Flats area are stable and performing adequately to minimize sediment into the river.

Currently, an evaluation of surface water and groundwater quality within Smelterville Flats is being conducted to determine the effectiveness of the Phase I remedy with respect to water quality goals. Biological monitoring to evaluate the status of ecological receptors within Smelterville Flats is ongoing and summary results are presented in Section 4.4.

### *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?*

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the Smelterville Flats remedial action.

Section 4.1.1 summarizes the ARARs review for the applicable OU2 decision documents. None of the new or revised standards identified in Section 4.1.1 call into question the protectiveness of the Smelterville Flats remedy.

### *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

This five-year review did not find any new information that calls into question the protectiveness of the Smelterville Flats Phase I remedy. As stated above, an evaluation of surface water and groundwater quality data is being conducted within OU2 to determine the effectiveness of the Phase I remedy. Results from recent biological resources sampling are also included in this evaluation.

Phase II will consider any shortcomings encountered in implementing Phase I and will specifically address long-term water quality and environmental management issues. Although the 1992 OU2 ROD goals did not include protection of ecological receptors, additional actions may be considered within the context of site-wide ecological cleanup goals as part of the Phase I remedy evaluation and consideration of a Phase II remedy.

### *Remedy Issues*

**Table 4-25. Summary of Smelterville Flats Remedy Issues**

| Remedy Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **Biological Monitoring:** Elevated metals concentrations were observed north of I-90 areas during biomonitoring. | N | Y |

### *Recommendations*

**Table 4-26. Summary of Smelterville Flats Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Biological Monitoring:** Conduct additional soil sampling for metals | USFWS | USEPA | 10/2006 | N | Y |

**Table 4-26. Summary of Smelterville Flats Recommendations and Follow-Up Actions**

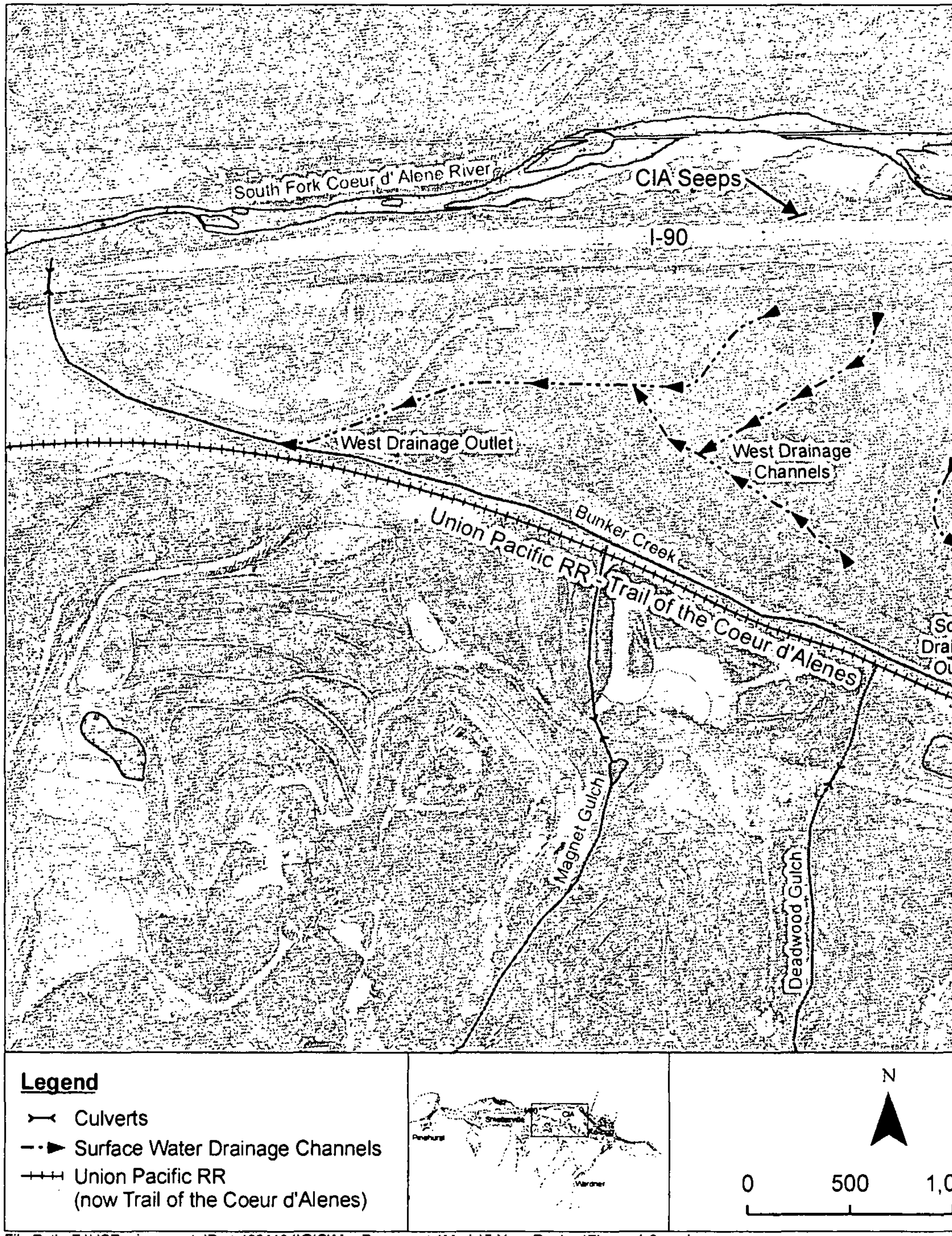
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) Current (now to 1 year) | Future (>1 year) |
|---|---|---|---|---|---|
| concentrations in north of I-90 areas where biomonitoring is occurring. | | | | | |
| **Smelterville Flats Phase 1 Remedial Action Effectiveness Monitoring:** Complete evaluation of the Phase I remedial action effectiveness monitoring data and revise the remedial action effectiveness monitoring plan as appropriate. | IDEQ, USEPA | IDEQ, USEPA | 7/2006 | N | Y |

## 4.3.4 Central Impoundment Area

The CIA (Figure 4-6) was constructed in 1928 as a repository for flotation tailings from Bunker Hill ore concentration mills. Over time, the CIA developed into an impoundment for tailings, mine waste, gypsum, other process waste and water, and AMD from the Bunker Hill Mine. The current configuration of the CIA is shown in Figure 4-6 and covers approximately 260 acres with embankments ranging in height from 30 to 70 feet above the valley floor. The CIA is bordered by I-90 on the north and Bunker Creek on the south.

Figure 4-7 shows the evolution of the CIA from its construction in 1928 through 1977. After 1977, no significant changes occurred to the CIA until its use as a waste repository during remedial actions in the mid to late 1990s and its eventual closure with an impermeable cap in 2000, discussed below. The CIA was built on top of the valley floor as it existed at the time of its construction in 1928. The bottom of the CIA was not lined. The valley floor at that time consisted of jig tailings piles from Bunker Hill mills located near the current southeast corner of the CIA and tailings and waste rock from Bunker Hill and other upstream sources. Historic mapping of the valley floor in this area conducted in 1918 suggests that in the current area of the CIA, the valley floor was mantled with a mixture of jig tailings and alluvium to thicknesses of up to 6 feet. In the early 1900s, the SFCDR channel was moved from the south side of the valley to the north side of the valley to make room for mining-related facilities. The pre-1900s SFCDR channel is approximately the same as the current Bunker Creek channel.

By 1965, all tailings and effluent generated as a result of Bunker Hill operations were being placed in the CIA. Between 1962 and 1963, 1.2 million cubic yards of tailings were removed from the CIA to construct the I-90 road embankment in the Kellogg area. In 1969, AMD from the Bunker Hill Mine began to be placed in the east cell of the CIA and decanted to SFCDR. In 1974, the AMD was decanted to the CTP, located at the southeast corner of the CIA, for treatment by lime precipitation. Placement of gypsum and process water from the Phosphoric Acid/Fertilizer Plant to the west cell of the CIA began in 1970. Disposal of operational and process waste streams to the CIA was mostly discontinued when industrial operations at the facility ceased in 1982. AMD from the Bunker Hill Mine continued to be




**Legend**

- Culverts
- Surface Water Drainage Channels
- Union Pacific RR (now Trail of the Coeur d'Alenes)

FIGURE 4-6

**OU2 CIA SITE MAP**
**BUNKER HILL SUPERFUND SITE**

FIVE-YEAR REVIEW

File Path: Z:\USEnvironmentalProte\321104\GIS\MapDocuments\Mxds\5-Year Review\Figure 4-6.mxd

placed in the east cell of the CIA and decanted to the CTP until the construction of the lined pond facility in 1996.

In general, tailings and gypsum were delivered to the CIA as slurries. The liquid portion of these slurries and the process effluent and AMD streams were either decanted or allowed to infiltrate through the CIA to the valley floor and eventually to groundwater and surface water near the CIA. The construction methods used to construct embankments and dikes within and surrounding the CIA led to the creation of preferential seepage pathways for CIA liquids. This resulted in a significant amount of seepage from the CIA to surrounding groundwater and surface water.

From the late 1960 through the 1970s, seepage from the CIA was investigated on several occasions. Of particular concern were discrete seepage locations on the southern bank of the SFCDR located coincident with the dividing dike between the east and west cells of the CIA, and another location near the west end of the CIA. During these investigations, it was found that an old stream channel consisting of clean gravel was located under the dividing dike between the east and west cells of the CIA that extends to the discrete seepage location in the south bank of the SFCDR. As stated above, the method of dike construction resulted in dikes acting as preferential seepage pathways. Seepage from the east and west ponds was moving through the dike down to the old stream channel and traveling to the SFCDR. At the time, it was believed that seepage from the CIA was entering the old stream channel and mixing with groundwater from the shallow aquifer in the area and discharging to the SFCDR.

Since the closure of the CIA with an impermeable cap in 2000, the discharge rates measured at these seeps have been reduced an order of magnitude. Groundwater elevations in the shallow aquifer in the area suggest that the current discharge associated with the discrete seepage location are associated with the shallow groundwater in the area and not direct seepage from the CIA.

#### 4.3.4.1 Review of ROD, ESD & ROD Requirements

Table 4-27 presents the remedial actions required by the 1992 OU2 ROD, the 1998 OU2 ESD, and the 2001 OU2 ROD amendment for the CIA.

**Table 4-27. Central Impoundment Area Remedial Actions Required**

| ROD and ESD Requirements | Remedial Action Objective/Goal |
|---|---|
| **1992 OU ROD** | |
| Temporary dust control measures (Section 9.2.3) | Minimize releases from this source |
| Collection of upper zone groundwater north of the CIA for wetland treatment (Section 9.2.3) | Maximize efficient interception of contaminated groundwater from the "CIA seeps" |
| Repository for consolidation of tailings, gypsum, and other non-principal threat materials removed as part of site removals. (Section 9.2.3) | Prevent direct contact and minimize infiltration through contaminated media |
| Close CIA with a cap having a hydraulic conductivity of $1X10^{-6}$ cm/sec or less, and revegetate. (Section 9.2.3) | Minimize infiltration and control erosion |

| Table 4-27. Central Impoundment Area Remedial Actions Required | |
|---|---|
| **ROD and ESD Requirements** | **Remedial Action Objective/Goal** |
| **1998 OU2 ESD** | |
| Consolidation of industrial waste landfills to the CIA | Prevent direct contact and minimize infiltration through contaminated media |
| Consolidation of Arizona Mine Dump rock to the CIA | Prevent direct contact and minimize infiltration through contaminated media |
| Limited quantities of mine waste from other areas of the Coeur d'Alene Basin may be disposed in the CIA | Prevent direct contact and minimize infiltration through contaminated media |
| Close CIA without removing approximately 30,000 cubic yards of suspected principal threat materials | Increased protectiveness is provided by a lower permeability cap ($1X10^{-7}$ cm/sec), that is specified in the ROD |
| **2001 OU2 AMENDMENT** | |
| Create lined sludge impoundment on southeast corner of the CIA after reaching capacity of existing sludge impoundment | Provide location for CTP sludge disposal, reduce water introduced to CIA materials |

#### 4.3.4.2 Background and Remedial Actions Up to Year 2000

Table 4-28 summarizes the CIA remedial actions implemented as part of the OU2 remedy.

| Table 4-28. Central Impoundment Area Phase I Remedial Actions Prior to Year 2000 |
|---|
| In 1995 site removal materials and demolition debris from the Mine Operations Area began to be consolidated in the closure area. During 1999, residential soil from the USEPA's yard removal program in the Coeur d'Alene Basin was deposited in the CIA. In addition, some contaminated soil from the State of Idaho Trustee projects was also disposed in the CIA. |
| From 1997 through 1999, approximately 1.2 million cubic yards of tailings from the Smelterville Flats, and additional material from the mine waste dumps and soil from gulch removal actions, were placed and graded on the CIA. From 1999 to 2000, a geomembrane cover system was installed on the surface of the CIA with the exception of approximately 5 acres where the CTP sludge disposal cell is located. The cover system consists of a slag cushion layer, a geomembrane, a slag drainage layer, growth media, and vegetation at the surface. Drainage channels convey surface water off the cover to three discharge points along the CIA perimeter; two drainage channels discharge to Bunker Creek, and the remaining channel discharges to the SFCDR. The side slopes of the CIA were either covered with a minimum 6-inch layer of growth media and vegetated or were rocked depending on the steepness of the slope. The geomembrane cover placed on the CIA and the vegetation and rock placement on the exterior slopes are permanent means to mitigate dust from the CIA. The cap also reduces infiltration of water and metals migration. The area was fenced to prevent unauthorized access. |
| Remedial design evaluations indicated that it was not cost-effective to collect and treat the CIA seeps, and that once the CIA cap was completed and stormwater controls in place, 90 percent of the seepage in the CIA tailings pile would drain in 10 to 15 years without active collection (CH2M HILL, 1996). The seeps are routinely monitored since placement of the CIA geomembrane cap to evaluate whether the seepage flow and concentration is decreasing over time. |

#### *4.3.4.3 Actions Since Last Five-Year Review*

When the first five-year review report for OU2 was issued in September 2000, the CIA closure construction was nearly complete. Work completed between October and November of 2000 included installing the perimeter fencing to limit access to the CIA, final grading of access roads, and demobilization of the construction contractor. With the completion of these activities, the CIA Phase I remedy construction was complete.

#### 4.3.4.4 Technical Assessment of Remedial Actions

Per USEPA guidance (USEPA, 2001b), technical assessment was conducted by evaluating the following three questions related to protectiveness of the implemented remedial actions:

***Question A: Is the remedy functioning as intended by the decision documents?***

The Phase I CIA remedy is functioning as intended by the decision documents. Specific aspects of the remedy performance evaluation are described below.

As summarized in Section 4.3.4.1, the remedial objectives of the Phase I CIA Closure remedy are to:

- Prevent direct contact with contaminated material;
- Minimize infiltration through contaminated media; and
- Maximize efficient interception of contaminated groundwater from the CIA seeps.

To date, the first two objectives of the Phase I CIA remedy have been met and the interception of groundwater has been deferred to Phase II pending Phase I remedial action effectiveness evaluations. Therefore, this assessment focuses on the Phase I CIA remedies.

The CIA closure was complete in 2000. The first five-year review report for OU2 found no issues for the CIA closure and identified remaining work elements of completing the closure construction and ongoing monitoring of the CIA seeps (USEPA, 2000a).

Protectiveness of the Phase I CIA remedy was evaluated by inspecting the various remedial components that were put in place to achieve the objectives cited above, namely:

- Geomembrane cover system. The cover system (geomembrane, drainage layer, subgrade drainage piping, growth media, and vegetation) prevents direct contact with underlying contaminated material and greatly minimizes infiltration through the underlying contaminants;

- CIA side-slope grading and caps. The regraded side slopes of the CIA and the ICP caps placed on them (either rock barriers or growth media and vegetation) prevent direct contact with underlying contaminated materials and minimize infiltration; and,

- Surface water conveyance systems. A series of vegetated swales and rock-lined channels convey and channel precipitation and snow-melt off the CIA geomembrane cover and discharge either into Bunker Creek or the SFCDR. While not satisfying a specific remedial objective, the surface water conveyance system is integral to the function and integrity of the CIA geomembrane cover system.

Figure 4-6 shows the general CIA layout and the locations of the various surface water drainage systems that are discussed below.

The October 2004 site inspection showed that the capped area of the CIA was stable and providing an effective barrier to the underlying consolidated waste materials. No evidence of adverse settlement was found. Vegetation on the capped area was lush and regenerating yearly without maintenance efforts. Noxious weed control programs have periodically been

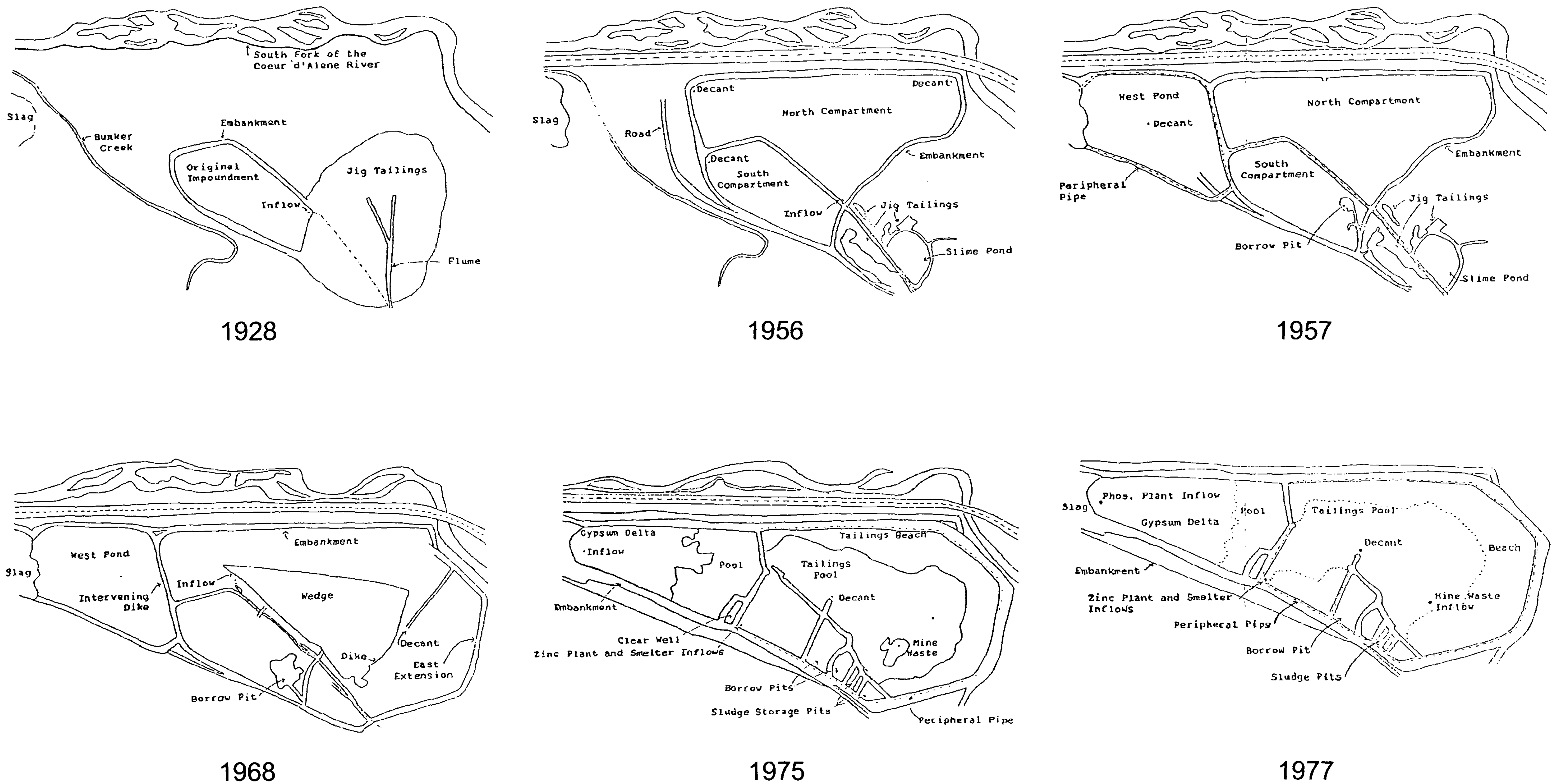



FIGURE 4-7
**EVOLUTION OF THE CIA**
**BUNKER HILL SUPERFUND SITE**
FIVE-YEAR REVIEW

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conducted on the CIA in an effort to control specific weeds. The presence of noxious weeds is a widespread concern in the western states and not related to the quality of the in-place vegetation remedy. The closure runoff control berms and swales were stable and provide effective means to channel runoff off the closure and into rock-lined perimeter discharge points. The rock-lined surface water discharge channels were stable and showed no signs of rock displacement. No Phase I remedy issues were found the CIA closure system.

Three maintenance items were identified during the October 2004 CIA inspection. These maintenance items were discussed with the USACE and were addressed as part of routine O&M:

- Southern surface water drainage system: Underdrain pipe leading to southern surface water discharge point at Bunker Creek appeared to be blocked. No flow was entering the sediment pond at the base of the CIA. Site reconnaissance was conducted by USACE in March 2005 and repair of system occurred in April 2005.
- Noxious plants on geomembrane capped area: Noxious weed control measures will continue as part of routine O&M. A long-term site-wide approach will be developed for managing noxious weeds.
- Surface crack along southwestern vegetated slope of CIA: A surface crack approximately 400 feet long and up to 6 inches deep was observed on a portion of the exterior CIA slope. This crack was inspected again by the USACE and the geotechnical design engineer of the cap and slope system in March 2005. The crack is thought to be the result of differential settlement of the topsoil and possibly slag drainage layer at the edge of the geomembrane cover, possibly aided by frost heave and rodent burrowing (CH2M HILL, 2005). This surface crack is not believed to be a threat to the stability of the CIA slopes, and it will continue to be observed as part of routine O&M.

Based on the completion of the remaining work cited in the 2000 five-year review report and the observations of the site inspection, the Phase I CIA remedy is performing adequately and as intended by the decision documents.

#### *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?*

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the Phase I CIA remedial action.

Section 4.1.1 summarizes the ARARs review for the applicable OU2 decision documents. As noted, the SMCRA of 1977 was revised in 2003 to include a requirement that post-action slopes either not exceed the angle of repose of the slope material or have a long-term static factor of safety of 1.3. The slopes of the CIA that were modified as part of the remedy were all designed to have a long-term static factor of safety of 1.5 or greater, therefore, exceeding the slope safety requirements established by the 2003 SMCRA revision. None of the other new or revised standards in Section 4.1.1 call into question the protectiveness of the Phase I CIA remedy.

### *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

This five-year review did not find any new information that calls into question the protectiveness of the Phase I CIA remedy. As mentioned under Question A, the collection and treatment of groundwater north of the CIA has been deferred to Phase II pending Phase I remedial action effectiveness evaluations. Capping of the unlined CTP sludge lagoon on top of the CIA will also need to be addressed as part of the Phase I evaluation.

In accordance with the 2001 OU2 ROD Amendment, the unlined CTP sludge lagoon on top of the CIA will need to be capped and replaced when its disposal capacity is reached. The 2001 OU2 ROD Amendment estimated that the lagoon would reach disposal capacity 10 years after the 2001 OU2 ROD Amendment was issued. Over 200 acres of the top of the CIA have been capped with a geomembrane liner, cutting off the infiltration pathway into the CIA. The CTP sludge lagoon remains the only uncapped portion of the CIA. Capping the unlined CTP sludge lagoon and replacing it with a lined facility would effectively eliminate the last remaining infiltration pathway through mine waste-contaminated materials in the CIA that are beneath the sludge lagoon. However, capping and replacement will be implemented after Phase I evaluations are completed, the existing lagoon is full, and a SSC amendment is signed that allows for full implementation of the 2001 OU2 ROD Amendment.

### *Remedy Issues*

**Table 4-29. Summary of CIA Remedy Issues**

| Remedy Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **SSC for 2001 OU2 ROD Amendment:** Lack of a SSC amendment prevents full implementation of the 2001 OU2 ROD Amendment, including installation of a new lined sludge pond on the CIA (if required). | Y | Y |

### *Recommendations*

**Table 4-30. Summary of CIA Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **SSC for 2001 OU2 ROD Amendment:** Continue, with the assistance of the State of Idaho, to pursue viable solutions to the SSC impasse. Once a solution is achieved, continue with implementation of the 2001 OU2 ROD Amendment. | IDEQ, USEPA | USEPA | 12/2007 | Y | Y |
| **CIA Phase 1 Remedial Action Effectiveness Monitoring:** Complete evaluation of the Phase I remedial action effectiveness monitoring data and revise the remedial action effectiveness monitoring plan as appropriate. | IDEQ, USEPA | IDEQ, USEPA | 7/2006 | N | Y |

## 4.3.5 Page Pond (PRP Action)

### 4.3.5.1 Introduction and Background

This remedial action is being conducted by the Upstream Mining Group (UMG), a PRP group currently comprised of ASARCO and the Hecla Mining Company, with oversight by the State of Idaho and the USEPA, pursuant to a Consent Decree (CD). [6]

The Page Pond Area is located near the west end of OU2, and is bounded on the east by the community of Smelterville, on the south and west by Highway 10, and on the north by the Union Pacific Railroad (UPRR) right-of-way (ROW) (Figure 4-5). The area comprises approximately 170 acres, including roughly 70 acres of tailings repository and 100 acres of wetlands and riparian habitat. Approximately 30 acres in the central portion of the inactive 70-acre tailings repository now serves as the site of the Page Pond Wastewater Treatment Plant (PPWTP), a publicly-owned facility constructed in 1974. The PPWTP includes four aeration lagoons and a stabilization pond located on top of the tailings impoundment. Treated effluent from the PPWTP is conveyed to an outfall to the SFCDR approximately a half-mile upstream from the confluence of the river with Pine Creek.

The Page Pond repository is essentially surrounded by water, which isolates it from public access except via the access road for the PPWTP. The repository is adjacent to two natural wetlands, the East Swamp and West Swamp. The wetlands are connected along the north boundary of the repository by the North Channel, which conveys water from the East Swamp to the West Swamp. A smaller channel (the South Channel) is located along the southern boundary of the repository. This channel conveys water that is split by the PPWTP access road. The eastern portion of the channel conveys localized runoff from the southeast corner of the repository and culvert runoff from the south side of Highway 10. This water flows eastward into the East Swamp. The western portion of the South Channel conveys water from Humboldt Creek and water coming from beneath the PPWTP. This water flows westward to the West Page Swamp. Cattails and other wetland plants are thriving in this section of the South Channel, as well as larger shrub and tree populations. The water levels and surface areas of the East and West Swamps fluctuate seasonally. High water levels appear during periods of heavy rainfall and snowmelt in the spring and early summer, and low water levels appear in the late summer and fall dry season.

### 4.3.5.2 Review of ROD, ESDs, and ROD Requirements

The 1992 OU2 ROD identified the tailings in the Page Pond area as a source of localized contamination of surface water and groundwater and of windblown dust. Remedial actions specified in the ROD are summarized in Table 4-31.

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[6] Consent Decree; Bunker Hill; United States of America and State of Idaho v. ASARCO Incorporated, Coeur d'Alene Mines Corporation, Callahan Mining Corporation, Hecla Mining Company, Sunshine Precious Metals, Sunshine Mining Company; Civil Action No. 94-0206-N-HLR; May 10, 1994.

| Table 4-31. Page Pond Remedial Actions | | |
|---|---|---|
| **Remedial Actions** | **Remedial Action Objectives/Goals** | **Success Criteria** |
| **1992 OU2 ROD (Section 9.2.4)** | | |
| Temporary dust control | Minimize exposure from fugitive dust | Meet ambient air criteria |
| Institutional controls | Prevent direct exposure to tailings and contaminated soil | Reduce the potential for accidental exposure |
| Maintenance of existing fencing | Prevent direct exposure to tailings and contaminated soil | Reduce the potential for unauthorized access |
| Divert and modify the channels of Humboldt and Grouse Creeks; consider the effect of modifications on habitat | Isolate the creeks from contact with tailings; minimize habitat destruction | Reduce releases from tailings into surface water; maintain habitats |
| Removal of exposed tailings from the West Page Swamp area and placement of this material on the Page Pond benches | Minimize exposure from fugitive dust; minimize releases to surface water and groundwater | Meet ambient air criteria; reduce releases from tailings to surface water and groundwater |
| Regrading, capping, and revegetation of the Page Pond tailings impoundment and dikes after emplacement of West Page Swamp tailings | Minimize exposure from fugitive dust; minimize releases to groundwater | Meet ambient air criteria; reduce releases from tailings to groundwater |
| Evaluation of wetlands associated with the Page Pond areas for water quality, habitat considerations, and bio-monitoring | Minimize habitat destruction | Maintain habitats |
| Enhancement of existing wetlands in West Page Swamp using hydraulic controls | Improve wetland vegetation and habitats | Enhance vegetation and habitats |

#### *4.3.5.3 Actions Since Last Five-Year Review*

At the time of the first five-year review for OU2 (USEPA, 2000a), the UMG had only completed removal of tailings from the West Beach, which is in the West Page Swamp area. The UMG conducted additional actions in 2000, which are described below; however, the UMG has not conducted additional remedial actions in Page Pond since the 2000 construction season.

- Exposed tailings in the eastern portion of the North Channel were graded and covered with a 12-inch clean soil barrier and then hydroseeded with native plant species in 2000. During the grading process, the channel also was trimmed to accommodate the design for a 100-year, 24-hour storm flow discharging from the East Swamp.

- An outlet control weir for the East Swamp discharge was constructed across the eastern end of the North Channel. The weir was constructed of compacted earth fill on firm native soil. A geosynthetic liner was placed and capped by a riprap blanket. The sill was cement-grouted at the crest with an armored spillway on the downstream face for erosion control. The weir allows discharge of East Swamp water to an elevation of 2,203.5 feet and has raised the discharge elevation by approximately 2 feet above the channel. The East Swamp now remains saturated throughout the year.

- An outlet control weir was placed at the discharge point of the West Swamp. The intention was to maintain the water level 2 feet above exposed tailings that remained in the West Beach area. First, the tailings in this area were excavated and removed around the weir location. Second, base material was placed and compacted. To control seepage, a geosynthetic clay liner (GCL) was used on the upstream face of the weir structure and was extended 2 feet below the invert. A cutthroat flume was installed at an invert elevation of 2,189.0 feet with a crest elevation of 2,192 feet. The flume was grouted in place at the weir structure and was covered with a metal enclosure to protect the device from weather damage and vandalism. A riprap blanket on a non-woven geotextile was placed over the weir structure to increase stability and to provide erosion protection. The disturbed areas were hydroseeded for erosion control.
- During the 2000 construction season, the UMG did not complete the full scope of work outlined in their Annual Remedial Action Work Plan (MFG, 2000). At the time, the UMG stated that the full scope of work was not completed due to the failure of the agencies to finalize NPDES issues. Since that time, the State of Idaho has adopted a variance to their Water Quality Standards for West Page Swamp for ammonia, chlorine, zinc, cadmium, and lead (see IDAPA 58.01.02.260.02.a). This variance has not yet been approved by the USEPA. The USEPA will continue to work with the IDEQ and other stakeholders to clarify the NPDES issues that must be addressed prior to completion of the remaining remedial actions described in the final Page Pond Closure Remedial Action Work Plan (MFG, 2000).

In addition, the USFWS, with funding from the USEPA, has completed a biomonitoring report that includes an assessment of waterfowl use of the Page Ponds area. The USFWS biomonitoring program is summarized in Section 4.4.3 of this document.

Interim O&M activities are being conducted at the site, such as maintenance of sediment control facilities (e.g., ditches, sediment traps, flumes, etc.) and dust control. Post-closure O&M activities will focus primarily on ensuring the integrity of the closure surfaces, drainage facilities, and site security provisions, and on addressing monitoring of the performance and effectiveness of the remedy. The first five-year review report stated that there may be issues with the existing Page Pond monitoring program, which should be further evaluated. The issues have not been further analyzed and final recommendations have not been reached.

#### 4.3.5.4 Technical Assessment of Page Pond Remedial Actions

Per USEPA guidance (USEPA, 2001b), technical assessment was conducted by evaluating the following three questions related to protectiveness of the implemented remedial actions:

***Question A: Is the remedy functioning as intended by the decision documents?***

The Page Pond remedial actions are under construction and have not been completed. Actions completed to date have been constructed in accordance with the requirements of the ROD and the UMG CD.

### Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. Section 4.1.1 summarizes the ARARs review for the applicable OU2 decision documents. None of the new or revised standards identified in Section 4.1.1 call into question the protectiveness of the Page Pond remedy. As stated above, the USEPA will continue to work with the IDEQ and other stakeholders to clarify the NPDES issues that must be addressed prior to completion of the remaining remedial actions for Page Ponds.

### Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

#### North Channel

As noted previously, the North Channel was recontoured and hydroseeded to reduce erosion and exposure to humans and wildlife. The initial hydroseeding has not survived and tailings are exposed. This channel is near the Trail of the Coeur d'Alenes and the South Fork Sewer District's lift station.

#### Vehicle Decontamination

The first five-year review report for OU2 (USEPA, 2000a) identified potential recontamination issues associated with the adequacy of current vehicle decontamination procedures at the residential soil repository. The report recommended that additional decontamination and drainage control procedures be implemented at the Page Pond area to mitigate future vehicle tracking of contaminants. No formal vehicle decontamination facility currently exists for the Page Repository.

#### Biological Monitoring

Biological monitoring conducted by the USFWS indicates that expansion of the Page Repository into the West Swamp would effectively reduce the overall wetlands component. If this expansion were to occur, mitigative measures would be required to compensate for the loss of wetland habitat. Biological monitoring results also indicate that waterfowl using the Page Ponds area continue to have blood lead levels above those considered to be clinically toxic to waterfowl. See Section 4.4.3 for more information on the biological monitoring results, including issues and recommendations.

An evaluation of surface water and groundwater quality data is being conducted within OU2 to determine the effectiveness of the Phase I remedy. Results from recent biological resources sampling are also being considered as part of this evaluation.

Phase II will consider any shortcomings encountered in implementing Phase I and will specifically address long-term water quality, and environmental management issues. Although the 1992 OU2 ROD goals did not include protection of ecological receptors, additional actions may be considered within the context of site-wide ecological cleanup goals as part of the Phase I remedy evaluation and consideration of a Phase II remedy.

## *Remedy Issues*

**Table 4-32. Summary of Page Pond Remedy Issues**

| Remedy Issues | Affects Protectiveness (Y/N) Current (now to 1 year) | Future (>1 year) |
|---|---|---|
| **North Channel:** The North Channel revegetated area has not survived the initial hydroseeding and tailings are exposed. This channel is near the Trail of the Coeur d'Alenes and the South Fork Sewer District's lift station. | Y | Y |
| **Remedial Effectiveness Monitoring Program:** Possible issues in the existing Page Pond monitoring program, which were noted in the first five year review, have not been further analyzed. | N | Y |
| **Repository Vehicle Decontamination:** Additional vehicle decontamination procedures have not been implemented at the repository. | Y | Y |
| **Biological Monitoring:** Mitigative measures should be considered for wetland loss at West Page Swamp due to expansion of Page Repository. | N | Y |
| **Remedy Implementation:** The remedy has not been fully implemented and no remedial actions have been conducted since 2000. | Y | Y |

## *Recommendations*

**Table 4-33. Summary of Page Pond Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) Current (now to 1 year) | Future (>1 year) |
|---|---|---|---|---|---|
| **North Channel:** Evaluate area that did not survive initial hydroseeding. Take action to re-establish vegetation and/or place a soil barrier over exposed tailings. Ensure access is limited to trail users, if appropriate. | UMG | IDEQ, USEPA | 04/2006 | Y | Y |
| **Remedial Effectiveness Monitoring Program:** Evaluate possible issues in existing Page Pond monitoring program. Review recommendations in 1999 monitoring program memorandum (CH2M HILL, 1999). Finalize monitoring program elements. | UMG | IDEQ, USEPA | 04/2006 | N | Y |
| **Repository Vehicle Decontamination:** Evaluate appropriate decontamination improvements and put measures in place to reduce the potential for recontamination. | IDEQ, PHD, UMG | IDEQ, PHD, USEPA | 04/2006 | Y | Y |
| **Biological Monitoring:** Evaluate biological monitoring results and wetland impacts related to Page Repository | IDEQ, UMG, USEPA | IDEQ, USEPA | 04/2006 | N | Y |

| Table 4-33. Summary of Page Pond Recommendations and Follow-Up Actions | | | | | |
|---|---|---|---|---|---|
| | | | | Follow-up Actions: Affects Protectiveness (Y/N) | |
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Current (now to 1 year) | Future (>1 year) |
| expansion. | | | | | |
| **Remedy Implementation:** Complete Page Ponds remedial actions. | UMG | IDEQ, USEPA | 12/2006 | Y | Y |

## 4.3.6 Industrial Complex

As defined by the 1992 OU2 ROD, the Industrial Complex consisted of three main areas, the Lead Smelter, the Zinc Plant (including the Phosphoric Acid Plant), and the MOA (see Figure 4-1). The Industrial Complex contained the most highly contaminated areas of the site, with metal concentrations well into percentage points in many instances. Process material accumulation sites were present within and outside the various facilities. Risk assessments conducted during the remedial investigation resulted in a subset of site process materials that were designated as PTMs based on their higher level of contamination. This section focuses on the remedy implemented for the Smelter Closure Area (SCA), PTM Cell, and the BAL. The MOA is discussed separately in Section 4.3.7.

### 4.3.6.1 Review of ROD, ESD & ROD Requirements

Table 4-34 presents the remedial actions required by the OU2 RODs, ESDs, and the OU2 ROD amendments for the Industrial Complex.

| Table 4-34. Industrial Complex Remedial Actions Required | |
|---|---|
| ROD and ESD Requirements | Remedial Action Objective/Goal |
| **1992 OU2 ROD** | |
| Temporary dust control on material accumulation sites (Section 9.2.1) | Control migration of windblown dust |
| Remove PCB transformers and PCB contaminated soils (Section 9.2.1) | Minimize direct contact risk |
| Repair or remove asbestos materials (Section 9.2.1) | Minimize direct contact risk |
| Demolish Lead Smelter, Zinc Plant and Phosphoric Acid Plant structures in-place and cap to reduce infiltration (Section 9.2.1) | Minimize direct contact risk |
| Relocate Boneyard materials under Smelter Cap (Section 9.2.5) | Minimize direct contact risk |
| Consolidate under the Smelter Cap: -slag from west cell of CIA -material accumulations including former waste disposal or holding pond sediments within Smelter Complex –contaminated soil, tailings, and mine waste from removal actions conducted within the site boundaries (Section 9.2.5) | Minimize direct contact risk |
| Close the Smelter Closure Area with a cap having a hydraulic conductivity of 1 x $10^{-7}$ cm/sec or less and revegetate to minimize erosion (Section 9.2.5) | Minimize direct contact and infiltration and control erosion |

**Table 4-34. Industrial Complex Remedial Actions Required**

| ROD and ESD Requirements | Remedial Action Objective/Goal |
|---|---|
| Reprocess principal threat materials (PTM) and other recyclable materials to minimize the volume of materials under the closure cap (Section 9.2.5) | Material reuse |
| **1996 OU2 ESD** | |
| Place contaminated materials and debris from the Zinc and Phosphoric Acid Plants in the Lead Smelter Closure and eliminate the closure planned for the Zinc Plant Area. | Reduce O&M costs by eliminating Zinc Plant closure. |
| **1996 OU2 ROD Amendment** | |
| PTMs, except mercury, will be contained under the Lead Smelter Cap in a fully lined monocell. This amends the 1992 OU2 ROD (Section 9.2.5) that required chemical stabilization of all PTMs. Mercury contaminated material will be stabilized per the 1992 OU2 ROD. | Minimize direct contact risk and reduce potential for migration to groundwater |
| **1998 OU2 ESD** | |
| Demolish 4 stacks in the Lead Smelter and Zinc Plant | Minimize direct contact risk |
| Maintain the Zinc Plant Concentrate Handling Building and Warehouse Building so that these structures can be turned over to the county for use as maintenance facilities. | Decontaminate structures to minimize direct contact risk |
| Demolish the Phosphoric Acid Plant Warehouse | Minimize direct contact risk and imminent safety hazard |
| **2001 OU2 ROD Amendment** | |
| In lieu of constructed wetlands treatment as described in the 1992 OU2 ROD, contaminated flows from the Smelter Closure Area PTM cell drainage, closure toe drain flow, and flow from an abandoned stormwater drain line originating south of the closure area) will be treated in an upgraded Central Treatment Plant. (Note: since completion of the Smelter Closure in 1998, these contaminated flows have been treated at the existing CTP as an interim measure). | Reduction of contamination to surface water and groundwater |

#### 4.3.6.2 Smelter Closure Area and PTM Cell

***Background and Remedial Actions Up to Year 2000***

The Industrial Complex remedial action consolidated highly contaminated soil and material accumulations from site removal actions and debris resulting from demolition of the Industrial Complex structures into an engineered closure with a low-permeability geomembrane cap. This 30-acre SCA (Figure 4-8) was designed to accommodate up to 420,000 cubic yards of material.

The SCA remedy presented in Table 4-35 was implemented between 1995 and 1998.

| Table 4-35. Smelter Closure Area Remediation Prior to Year 2000 |
|---|
| Demolition debris from the Lead Smelter, Phosphoric Acid, and Zinc Plants was consolidated in the Smelter Closure area. |
| Boneyard soil and larger wood and metal debris was also deposited in the general Smelter Closure area. |
| Slag and contaminated soil from various site removals was used as in-fill material to minimize void spaces and the potential for future settlement. |
| The PTM Cell was constructed within the boundary of the Smelter Closure in 1996. This geomembrane-lined mono-cell has a seep collection system that conveys seepage, if generated, to the Sweeney pump station and eventually to the CTP for treatment. |
| PTMs (including the copper dross flue dust relocated from Magnet Gulch) and stabilized mercury contaminated materials were deposited in the PTM cell beginning in 1996. The PTM volume placed in the cell was not surveyed; however, based on general elevations of the top geomembrane cover, it is estimated that about 80,000 to 100,000 cubic yards of PTMs are contained in the PTM cell. The PTM cell was closed with a geomembrane cover in 1997. Contaminated soil from other site removal actions was placed on top of the PTM Cell cover as needed to complete the overall grading of the Smelter Closure Area. |
| A shallow 3 to 4-foot deep "toe-drain" was constructed along a portion of the northern edge of the closure area to collect underdrain flow and convey this water to the Sweeney Pump Station for eventual treatment at the CTP. |
| The Smelter Closure area was capped with a geomembrane liner, a drainage layer, growth media and revegetated with a native plant seed mix. |
| A surface water management system prevents run-on onto the closure cap. A separate surface water system conveys precipitation off the closure cap using a series of berms and ditches. Collected surface water is conveyed to Magnet and Bunker Creeks. |
| A perimeter fence with locking gates was constructed around the Smelter Closure Area as an institutional controls measure to prevent access to the area. |

### *Actions Since Last Five-Year Review*

This remedial action was complete in 1998.

As noted above in Table 4-34, the 2001 OU2 ROD Amendment requires treatment of the contaminated flows from the SCA in an upgraded CTP. Sources of water collected from the SCA for treatment include the toe drain located on the northwestern edge of the closure, the PTM Cell, and an abandoned stormwater drain line believed to originate in the West Canyon area south (uphill) of the closure area. The lack of an SSC with the State of Idaho for the 2001 OU2 ROD Amendment prevents full implementation of this ROD amendment and the necessary upgrades to the CTP.

In 2004, a gravity collection and conveyance system for drain water collected from the SCA sources described above was designed to replace a pumped system that conveyed water to the Lined Pond for eventual treatment at the CTP. The gravity system was constructed in 2005. The system included a new collection manhole to combine PTM Cell drainage and Smelter Closure drainage, and a 6-inch HDPE pipeline to convey the drain water to the Lined Pond (CH2M HILL, 2004b).

## 4.3.6.3 Borrow Area Landfill

### *Background*

The BAL (Figure 4-8) was developed in 1997 and 1998 to provide "clean" fill for several of the site remediations (CH2M HILL, 2002a). A portion of the BAL was subsequently used to dispose lower-level contaminated soil and solid waste from the upper Industrial Landfill

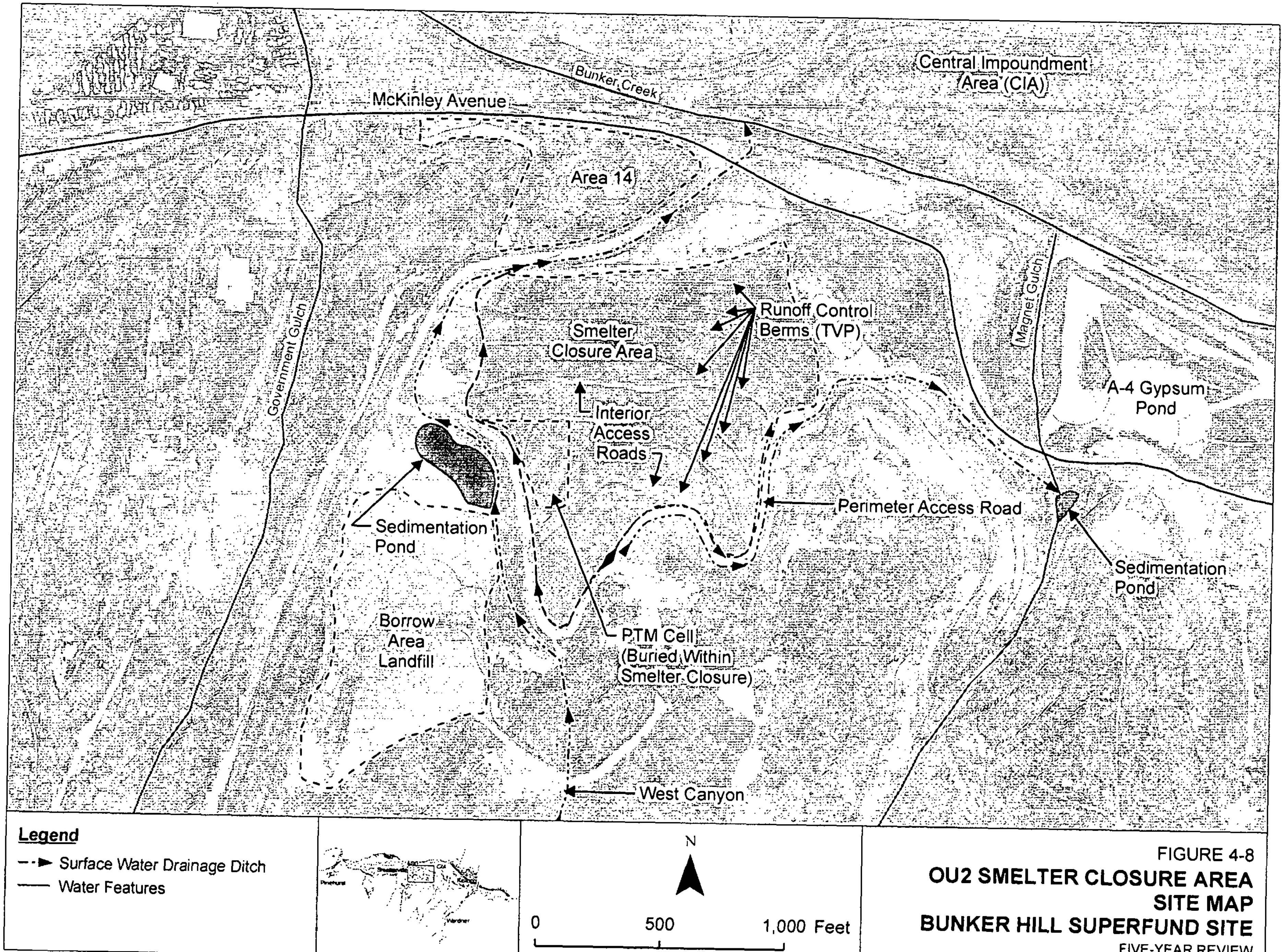


FIGURE 4-8
**OU2 SMELTER CLOSURE AREA SITE MAP**
**BUNKER HILL SUPERFUND SITE**
FIVE-YEAR REVIEW

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located in Railroad Gulch. Table 4-36 presents activities at the BAL in 2000, which is the year it was constructed.

| Table 4-36. Borrow Area Landfill Activities Prior to Year 2000 |
|---|
| With the closure of the OU2's primary waste consolidation areas (the Smelter Closure in 1997 and the CIA in 2000), a disposal area within the borrow area, the Borrow Area Landfill, was constructed in 2000 to accept contaminated soil and waste generated by the remaining remedial actions at the site. |
| Approximately 79,000 cubic yards of solid waste from the upper industrial landfill were placed in the Borrow Area Landfill during the 2000 construction season. |

### *Actions Since Last Five-Year Review*

In 2001, another 111,000 cubic yards of waste were disposed in the BAL. The disposed material consisted of mine tailings, contaminated soils, railroad wastes, wood wastes, and other waste materials. All of the wastes were below the PTM action levels.

In early 2002, the USEPA and the State of Idaho decided to close the BAL. A closure design was completed (CH2M HILL, 2002a) and construction began in the summer of 2002. The closure work consisted of final grading on the BAL, modifications to surface water management to provide a long-term system, placement of a soil cover, hydroseeding, and establishing settlement monitoring points.

## 4.3.6.4 Area 14

### *Background*

Area 14 is within the Industrial Complex. This area is approximately 8 acres bounded to the north by McKinley Avenue, to the south by the SCA and Sweeney Heights including the BAL Road, to the east by the lead smelter, and to the west by Government Gulch Road. Area 14 has been defined as the West Slag Dumps of the Smelter Complex due to blast furnace slag piles that were staged on the eastern portion of the subarea. The western portion of the area contains the Sweeney Mill site and an area leased to Avista Utilities and Williams Gas.

The center-northern portion of Area 14 contains the Sweeney Pump Station that carries the SCA leachate and water from the vehicle decontamination station to the CTP. The eastern area of the site (currently referred to as the Area 14 Coke Yard), receives contaminated soil from various Bunker Hill Box projects. There is a vehicle decontamination station used by local contractors in this repository area. Area 14 is currently designated for industrial use. Table 4-37 presents activities at Area 14 before 2000.

| Table 4-37. Area 14 Activities Prior to Year 2000 |
|---|
| Two former sedimentation ponds (Gilges Pond and Sweeney Pond) were excavated and backfilled in 1997 and 1999, respectively. |

### *Actions Since Last Five-Year Review*

In October 2004, the USACE conducted sampling of the Sweeney Mill portion of Area 14 (there is ample data on the Coke Yard portion of the area). Sample results showed levels above 1,000 mg/kg lead, and three of the samples measured above the PTM of 84,600 mg/kg lead.

Based on historical sampling data for the Coke Yard, and the preliminary sampling results of the Sweeney Mill portion, further site characterization and phased remedial designs and remedial actions will be initiated in 2006. Actions will first focus on the Avista Utilities and Williams Gas portion, then on the Sweeney Mill and adjacent hillside portion, and finally on the Coke Yard portion of Area 14.

#### 4.3.6.5 Technical Assessment of Smelter Closure Area, Borrow Area Landfill and Area 14 Remedial Actions

Per USEPA guidance (USEPA, 2001b), technical assessment was conducted by evaluating the following three questions related to protectiveness of the implemented remedial actions:

***Question A: Is the remedy functioning as intended by the decision documents?***

The SCA and BAL remedial actions are functioning as intended by the decision documents. The remedy for Area 14 has yet to be determined; however, the same RAOs will apply. Specific aspects of the remedy performance evaluation are described below.

As summarized in Table 4-34, the remedial objectives of the SCA remedy are to:

- Minimize direct contact risk from various contaminated materials;
- Reduce O&M costs by eliminating the Zinc Plant closure area (as initially required by the 1992 OU2 ROD);
- Minimize water infiltration into the consolidated waste materials;
- Control erosion; and,
- Reduce the potential for contaminant migration to groundwater.

While not a specific remedy component called for in the 1992 OU2 ROD, the BAL was an ancillary action that provided clean fill material for use in many of the other site remedies. This assessment section of this report will address the closure aspects of the BAL.

As noted above, the SCA was complete in 1998. The first five-year review report for OU2 identified remaining work items of construction and closure of the BAL and ongoing monitoring of groundwater wells that are part of the "observational approach" being used to monitor seepage from the closure area. At the time of the initial five-year report, no issues were found related to the SCA remedy. As noted above, the BAL was constructed and closed between 2000 and 2002. Groundwater wells in the vicinity of the SCA are routinely monitored.

Remedy performance of the SCA remedy and BAL was evaluated by inspecting the various remedial components that were constructed to achieve the objectives cited above, namely:

- Geomembrane cover system: The SCA cover system (geomembrane, drainage layer, geosynthetic strip drains, subgrade drainage piping, growth media, vegetation) prevents direct contact with underlying contaminated material and greatly minimizes infiltration through the underlying contaminants.
- Closure run-on and run-off control systems: A series of runoff control berms and vegetated swales channel precipitation and snow-melt off the SCA cap to rock-lined

perimeter ditches. Area grading and additional perimeter ditches prevent surface water run-on onto the SCA. The channeled surface water discharges to either Bunker Creek or Magnet Gulch. While not addressing a specific remedial objective, the surface water conveyance system is integral to the function and integrity of the SCA geomembrane cover system.

- Closure underdrain systems: The PTM cell underdrain and the closure toe-drain (and subsequent treatment of flows emanating from these systems) address the remedial objective of reducing migration of contaminants to groundwater.
- BAL grading and vegetation: The grading and vegetation of the closed BAL minimize erosion.
- Perimeter fencing and gates: The perimeter fence surrounding the SCA prevents access, thereby preventing direct contact opportunities.

Figure 4-8 shows the general SCA layout and identifies the locations of the various surface water drainage systems that are discussed below.

The October 2004 site inspection showed that the capped area of the SCA is stable and provides an effective barrier to the underlying consolidated waste materials. No evidence of settlement was found. Vegetation on the capped area is lush and regenerating yearly without maintenance efforts. The closure runoff control berms and swales are stable and provide effective means to channel runoff off the closure area and into perimeter ditches. The rock-lined perimeter ditch systems are stable and show no signs of rock displacement. No remedy issues were found for the SCA system.

Three maintenance items were identified during the SCA inspection, and were discussed with the USACE and have been or will be addressed as part of routine O&M:

- Culvert cleaning: one culvert on the northern edge of the closure area had become disconnected. In March 2005, the USACE cleaned out the sediment, reconnected the culvert, and cleaned out the rock and vegetation around the outlet.
- Erosion of a runoff control swale: A localized area of a closure runoff control swale had eroded down to the geomembrane where the swale intersects with the rock-lined perimeter ditch system. Since the site inspection, the USACE has addressed this issue by filling in the eroded portion of the swale, raising the grade to ensure that water drains appropriately to the perimeter on the geomembrane cover system, and hydroseeding disturbed areas.
- Invasive plants on capped area: A few volunteer evergreen tree seedlings about 6 inches tall were observed, which are not appropriate for growth over a geomembrane cover system. The USACE will pull these seedlings in early spring 2006 when vegetation around the seedlings is dormant.

Based on the observations of the site inspection and the completion of the remaining work cited in the 2000 OU2 five-year review report (USEPA, 2000a), the SCA remedy is performing as designed and in accordance with the decision documents.

An evaluation of the performance of the Area 14 remedy will be conducted in the next five-year review.

### *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?*

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the SCA remedial action and the BAL.

Section 4.1.1 summarizes the ARARs review for the applicable OU2 decision documents. As noted, the SMCRA of 1977 was revised in 2003 to include a requirement that post-action slopes either not exceed the angle of repose of the slope material or have a long-term static factor of safety of 1.3. The final slopes of the SCA and BAL were all designed to have a long-term factor of safety of 1.5 or greater, and therefore they exceed the slope safety requirements established by the 2003 SMCRA revision. The final slope of the Area 14 hillsides will also meet or exceed this requirement.

None of the other changes to the new or revised standards in Section 4.1.1 call into question the protectiveness of the Phase I remedies for the SCA, BAL, or Area 14 actions.

### *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

This second five-year review did not find any new information that calls into question the protectiveness of the SCA remedial action or the BAL. As stated above, site characterization, design, and remediation of Area 14 will be initiated in 2006.

### *Remedy Issues*

**Table 4-38. Summary of Industrial Complex Remedy Issues**

| Remedy Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **SSC for 2001 OU2 ROD Amendment:** Lack of SSC amendment between the USEPA and the State of Idaho prevents full implementation of the 2001 OU2 ROD Amendment that would upgrade the CTP where Smelter Closure Area flows are treated. | Y | Y |

### *Recommendations*

**Table 4-39. Summary of Industrial Complex Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Area 14 Remediation:** Initiate phased site characterization, remedial design and remedial action at Area 14. | USEPA | USEPA | 3/2006 | N | Y |

**Table 4-39. Summary of Industrial Complex Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) Current (now to 1 year) | Future (>1 year) |
|---|---|---|---|---|---|
| **SSC for 2001 OU2 ROD Amendment:** Continue, with the assistance of the State of Idaho, to pursue viable solutions to the SSC impasse. Once a solution is achieved, continue with implementation of the 2001 OU2 ROD Amendment. | IDEQ, USEPA | USEPA | 12/2007 | Y | Y |

## 4.3.7 Mine Operations and Boulevard Areas

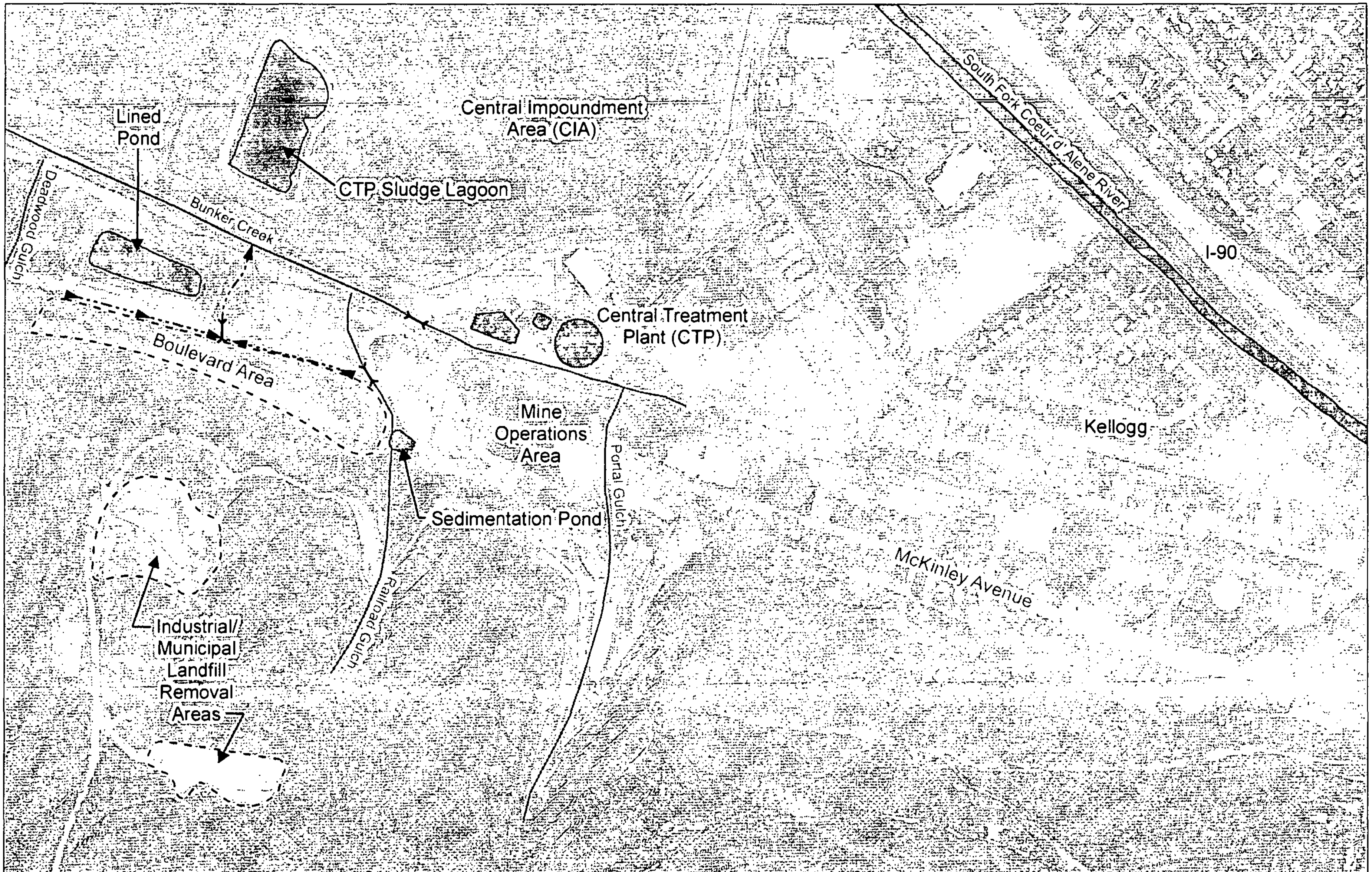
Figure 4-9 shows the historic location of the Mine Operations and Boulevard Areas. Historically, the MOA consisted of land and ore processing structures bounded on the north by the UPRR and the CTP and on the south by the cut-slope hillsides leading up to the Bunker Hill Mine.

McKinley Avenue bisects the MOA in the east-west direction. When initial ore processing was conducted at the Mine Operations facilities, the Boulevard Area was used as a staging area for concentrates prior to being loaded into rail cars and transported to the Lead Smelter.

Performance standards for the remedies include:

- Decontamination procedures for offsite salvage that are consistent with the proposed rule for Best Demonstrated Available Technology (BDAT) treatment technologies for contaminated debris (Federal Register January 9, 1992).
- Management of polychlorinated biphenyl (PCB) containing equipment and other regulated wastes in accordance with the Toxic Substance Control Act (TSCA) and the Resource Conservation and Recovery Act (RCRA).
- Management of asbestos-containing materials in accordance with applicable regulations.
- Soil removal goal: Soil with lead concentration greater than 1,000 mg/kg.
- Placement of a minimum 6-inch-thick clean fill cap over removal areas if surface concentrations are greater than 1,000 mg/kg lead in compliance with ICP requirements for industrial sites. Clean barrier fill is defined as having less than 100 mg/kg lead.

During remediation, the soil removal goal was not achieved in all areas due to the depth and extent of contamination. In these areas, the excavation went as deep as feasible and was then regraded and capped with an ICP-approved barrier in areas where remaining concentrations were greater than 1,000 mg/kg lead.




**Legend**
- Culverts
- Surface Water Drainage Channels
- Water Features

FIGURE 4-9
**OU2 MINE OPERATIONS AREA SITE MAP**
**BUNKER HILL SUPERFUND SITE**
FIVE-YEAR REVIEW

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#### 4.3.7.1 Review of ROD, ESD & ROD Requirements

| Table 4-40. Mine Operations and Boulevard Areas Remedial Actions Required | |
|---|---|
| **ROD Requirement** | **Remedial Action Objective/Goal** |
| **1992 OU2 ROD (Section 9.2.5)** | |
| MOA: Demolish or decontaminate structures consistent with intended future use from the bottom of the mill settling pond | Prevent direct contact |
| MOA: Close or remove contaminated soil | Prevent direct contact and minimize infiltration through contaminated media |
| MOA and Boulevard: Remove non-PTM contaminated soils with metal concentrations in excess of what would typically be attributed to mine waste rock or tailings and dispose in the Smelter Closure area. Place a minimum of 6-inches of clean soil or other barrier appropriate to land use as a cover where surface concentrations exceed 1,000 ppm lead. | Prevent direct contact and minimize infiltration through contaminated media |
| MOA: Process, recycle or stabilize PTM accumulations and consolidate these materials within the Smelter Closure area | Material reuse, minimize material disposed and prevent direct contact |
| **1996 OU2 ROD Amendment** | |
| Boulevard: Dispose PTMs under the Smelter Closure cap in a fully lined monocell (this amends the 1992 OU2 ROD (Section 9.2.5) that required chemical stabilization of PTMs) | Prevent direct contact |

#### 4.3.7.2 Background and Remedial Actions Up to Year 2000

The mining and ore-processing structures and facilities that were included in this remedial action of the MOA consisted of the powerhouse, the concentrator silo and conveyor system, the concentrator building and trestle system to the CIA, the mill settling pond, and two small ancillary office buildings west of the concentrator building. The RI (MFG, 1992b) indicated that the Boulevard Area soils were contaminated to levels exceeding principal threat levels as a result of the historic staging of concentrates in this location.

The MOA facilities operated until the early 1980s. With the bankruptcy of the owner, the MOA land and buildings were deeded to Shoshone County as payment for back-taxes. The USEPA and the State of Idaho elected to use a site PRP, the BLP, and the USEPA-controlled bankruptcy fund to contract and conduct the remediation of the MOA area. The MOA remediation was completed in 1995 and consisted of the actions in Table 4-41.

| Table 4-41. MOA Remediation Prior to Year 2000 (as reported in the first Five-Year Review Report) |
|---|
| Characterization and removal of hazardous materials located within buildings. |
| Removal of concentrates and ores for reprocessing. |
| Asbestos abatement and offsite disposal. |
| Wash-down of buildings prior to demolition |
| Demolition of buildings and disposal of debris on top of the CIA. |
| Contaminated soil removal consistent with the ICP program. |
| Site grading and placement of ICP barriers. |
| Revegetation in designated areas. |

The remediation of the Boulevard Area remediation was completed in 1997 and consisted of the actions in Table 4-42.

| Table 4-42. Boulevard Area Remediation Actions Prior to Year 2000 |
|---|
| PTMs and contaminated soil were removed from one to 6 feet deep. PTMs were transported to the Smelter Closure and disposed in the geomembrane-lined PTM Cell; contaminated soil with lead concentrations less than PTM-level (84,600 mg/kg) were disposed in the general Smelter Closure area as in-fill of demolition debris and for closure grading. |
| Soil was replaced with clean soil and surface water control measures. Surface water flows to a roadside ditch constructed parallel to McKinley Avenue with culverts under McKinley Avenue that eventually conveys Boulevard Area runoff to Bunker Creek. |

#### 4.3.7.3 Actions Since Last Five-Year Review

This remedial action was complete in 1997. No further remedial work has been conducted.

The USACE routinely inspects all completed remedial actions at the Site. Since completion, the MOA and Boulevard Area have not required maintenance to maintain the integrity of the remedy.

#### 4.3.7.4 Technical Assessment of Remedial Actions

In accordance with USEPA guidance (USEPA, 2001b), technical assessment was conducted by evaluating the following three questions related to protectiveness of the implemented remedial actions:

***Question A: Is the remedy functioning as intended by the decision documents?***

The MOA remedy is functioning as intended by the decision documents. Specific aspects of the remedy performance evaluation are described below.

The initial five-year review reported that the MOA and Boulevard remedies were implemented as designed, and were performing adequately in meeting the 1992 OU2 ROD requirements of minimizing direct contact with contaminants. The first five-year review report made no recommendations for improvement to this remedial action.

As part of this second five-year review report, the MOA and Boulevard Areas were inspected in October of 2004. This site inspection indicated that the soil caps in the MOA and Boulevard areas remain intact and prevent direct contact with underlying contaminated soils. The vegetation on both the MOA and Boulevard areas is well established and is regenerating yearly without any maintenance. Also, surface water runoff ditches and culverts are performing as necessary to channel flow to Bunker Creek.

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the MOA remedial action.

Section 4.1.1 summarizes the ARARs review for the applicable OU2 decision documents. None of the new or revised standards identified in Section 4.1.1 call into question the protectiveness of the MOA remedy.

### *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

This five-year review did not find any new information that calls into question the protectiveness of the MOA remedy.

### *Remedy Issues*

**Table 4-43. Summary of MOA and Boulevard Remedy Issues**

| Remedy Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| None | -- | -- |

### *Recommendations*

**Table 4-44. Summary of MOA and Boulevard Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| None | -- | -- | -- | -- | -- |

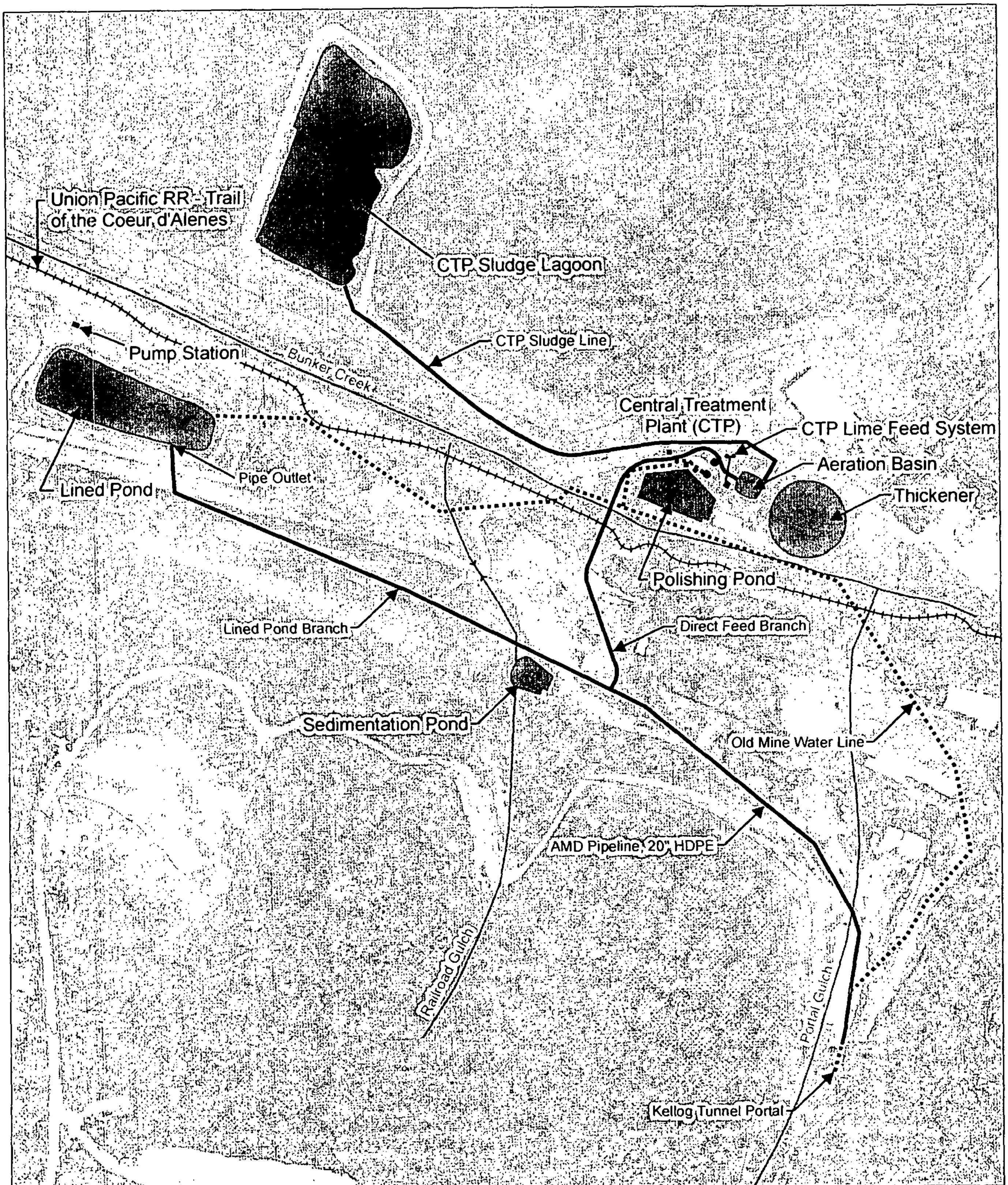
## 4.3.8 Central Treatment Plant

The CTP was constructed in 1974 to treat metals-laden AMD from the Bunker Hill Mine and process water from various industrial complex facilities using a lime precipitation process. The CTP is located at the base of the southeast corner of the CIA (Figure 4-10).

### 4.3.8.1 Review of ROD, ESD & ROD Requirements

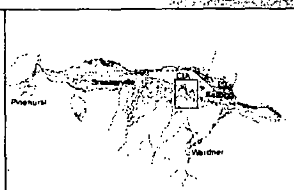
The 1992 OU2 ROD required that AMD be conveyed to the CTP for pre-treatment prior to additional treatment in a constructed wetland system located in Smelterville Flats (see Table 4-45). In February 1998, the USEPA and the State of Idaho jointly identified the need to begin evaluations for long-term mine water management. An RI/FS was initiated in August 1998 and completed in 2001 (CH2M HILL, 2001a). This study focused on the AMD issues associated with the Bunker Hill Mine and long-term water treatment needs for the site.

Based on the results of the mine water RI/FS, the USEPA issued a ROD Amendment (USEPA, 2001a) that required several upgrades to the CTP and related facilities (see Table 4-45). Also, the 2001 OU2 ROD Amendment removed the wetland treatment requirement for AMD in lieu of treatment at the CTP (in addition to other aspects of the Selected Remedy that focused on reduction of the production of AMD). The 2001 OU2 ROD Amendment was necessary because the wetlands system identified in the 1992 OU2 ROD for treatment of AMD and other site water sources was found to be incapable of meeting treatment levels (USBM, 1998). In addition, the existing treatment facility, which had not been significantly upgraded since it was built in 1974, was not capable of consistently




**Legend**

- Culverts
- Union Pacific RR (now Trail of the Coeur d'Alenes)



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0 100 200 Feet

FIGURE 4-10
**OU2 CENTRAL TREATMENT PLANT (CTP) SITE MAP**
**BUNKER HILL SUPERFUND SITE**
FIVE-YEAR REVIEW

File Path: Z:\USEnvironmentalProte\321104\GIS\MapDocuments\Mxds\5-Year Review\Figure 4-10.mxd

meeting current water quality standards, and required repair and replacement to prevent equipment failure.

### 4.3.8.2 Background and Remedial Actions Up to Year 2000

When the 1992 OU2 ROD was written, mine water flowed by gravity to the top of the CIA into an unlined holding pond prior to being conveyed to the CTP for treatment. Additional metals-contaminated water from other site sources (runoff from the Zinc Plant, Phosphoric Acid Plant, and the Lead Smelter) was pumped to the CTP for treatment beginning in the mid-1970s. To continue treatment of the Bunker Hill mine water and other contaminated site flows, the USEPA and the State decided that it was necessary to improve operational efficiency of the CTP, conduct more routine maintenance, and upgrade some equipment. In addition, it was decided to cease the historic practice of placing acidic mine water in unlined ponds on top of the CIA. As a result of these decisions by the USEPA and the State, the remedial actions presented in Table 4-46 were conducted at the CTP from 1995 to 2000.

**Table 4-45. CTP Remedial Actions Required**

| ROD Requirement | Remedial Action Objective/Goal |
|---|---|
| **1992 OU2 ROD** | |
| Pre-treatment of Bunker Hill Mine water prior to treatment in the collected water wetland (Section 9.2.5 and 9.2.10) | Reduce metal concentrations in AMD to levels that can be treated using constructed wetland |
| **2001 OU2 ROD AMENDMENT** | |
| AMD Mitigations/Source Control:<br>• West Fork Milo Creek Diversion<br>• Phil Sheridan Diversion rehabilitation<br>• Plug in-mine drill holes | Reduce the flow of mine water from the Bunker Hill Mine |
| AMD Collection: Continue to perform in-mine water collection system maintenance to collect and transport AMD to the Kellogg Tunnel | Prevent AMD from discharging at locations other than the Kellogg Tunnel |
| AMD Conveyance:<br>New mine water line from the Kellogg Tunnel to the Lined Pond<br>Install pipeline to convey mine water from Kellogg Tunnel directly to the CTP | Provide cost effective means of conveying mine water from the Kellogg Tunnel to the CTP and Lined Pond storage area |
| AMD Storage:<br>Continued repair and maintenance of the Lined Pond<br>Construct a new gravity diversions within the mine to convey water to the mine pool for storage<br>Install a new mine pool extraction system | Provide storage for AMD to prevent flows greater than treatment capacity under high flow conditions and to allow for periodic maintenance of the CTP. |
| AMD Treatment:<br>Upgrade treatment plant capacity to 2,500 gpm<br>Installation of tri-media filters<br>Installation of a backup power system<br>Rehabilitate existing equipment<br>Improvements and additions to the lime feed and | Meet effluent requirements for the CTP and prevent CTP upsets |

**Table 4-45. CTP Remedial Actions Required**

| ROD Requirement | Remedial Action Objective/Goal |
|---|---|
| polymer makeup systems<br>Replacement of the existing antiquated and mostly inoperable control system with a modern computer based process control and operator interface system<br>If CTP capacity greater than 2,500 gpm is required, install a second neutralization/oxidation reactor and additional filters | |
| Sludge management – construct a lined disposal bed for CTP sludge when additional sludge capacity is required | Provide a lined storage facility for CTP sludge |
| Site water originally slated for treatment in the constructed wetlands will be treated in the CTP | Provide an alternative location for treatment of contaminated water |

**Table 4-46. CTP Remediation Prior to Year 2000**

| |
|---|
| Construction of a geomembrane-lined holding pond on McKinley Avenue to the west of the CTP beginning in the latter part of 1994 with construction completed in 1995. The lined pond pump station and piping conveyed influent directly to the CTP. The purpose of the lined pond is to provide additional water storage capacity, to modulate the flow rate into the treatment plant, and to provide mixing of flows with various contaminant levels prior to treatment at the CTP. |
| Failure modes and effects analysis of the CTP to identify maintenance needs, to evaluate the impact of various failure scenarios of the CTP, and to prioritize maintenance and equipment purchase needs. |
| Design of a new mine water pond and sludge holding facility. The USEPA's design contractor prepared 90 percent complete construction plans and specifications for a new lined pond and sludge facility that was to be constructed on top of the CIA. At the State's request, the construction of this mine water storage and sludge facility was deferred pending the results of a separate RI being conducted by the USEPA of the Bunker Hill Mine's acid mine drainage. |
| High-density sludge (HDS) pilot study to optimize treatment efficiency and as a means to decrease the sludge volume that would require disposal. |
| Installation of new mine water discharge line from the Kellogg Tunnel to the lined pond to replace the original line that failed to carry the necessary volume of mine water flows. |
| Miscellaneous O&M activities: rebuilding the thickener drive-head; periodic raising of the sludge impoundment berms; closing the east sludge cell. |
| Six-inch minimum ICP barrier placed on the CTP property (approximately 12.4 acres). |

### 4.3.8.3 Actions Since Last Five-Year Review

#### *Mine Water RI/FS and 2001 OU2 ROD Amendment*

As noted above, an RI/FS was conducted by the USEPA and the State of Idaho to evaluate options for the long-term management of AMD from the Bunker Hill Mine. The investigation included options for reducing the metals content and amount of mine drainage being produced by diverting surface water from the most acid-laden portions of the mine, upgrades to the current treatment plant, and options for continued sludge disposal.

In December 2001, an OU2 ROD Amendment was issued based on this RI/FS. Consistent with CERCLA, implementation of this ROD Amendment requires that the State and the

USEPA agree on its implementation and sign an SSC amendment. To date, the USEPA and the State of Idaho have not concluded negotiations on a SSC amendment that allows for full implementation of this ROD amendment. Time-critical components of the 2001 OU2 ROD Amendment were implemented, however, to avoid potential catastrophic failure of the aging CTP and to provide for emergency mine water storage (USEPA and IDEQ, 2003) These time-critical activities focused on preventing discharges of AMD to Bunker Creek and the SFCDR (see discussion below). Until this SSC amendment is signed, the USEPA cannot use remedial action funds to implement the remainder of the mine water remedy, including additional CTP upgrades identified in the 2001 OU2 ROD Amendment.

#### *Direct-Feed Mine Water Line*

During the winter of 2001-2002, a direct-feed mine water pipeline was constructed from the Kellogg Portal to the CTP aeration basin. This direct-feed line bypassed the Lined Pond and added flow management options for the system (i.e., ongoing treatment of mine water while the Lined Pond is down for maintenance (CH2M HILL, 2000).

#### *Emergency Upgrades*

Under a Time-Critical Removal Action, several repairs and upgrades were made to the CTP and Lined Pond:

- New lime storage, make-up, and feed system consisting of two 14-foot-diameter, 100-ton silo assemblies and other equipment (slakers, slurry tank, dust collectors, pumps, etc.) (Fall 2004);
- Thickener repairs (Fall 2004);
- New sludge pipeline (Fall 2004);
- Electrical system/motor control center (MCC) upgrade (planned for 2005);
- New control system with updated hardware and software (planned for 2005);
- New control building to house electrical/MCC panels, control system, break room, lab/sample prep space, office, and locker room facilities (planned for 2005); and
- New 750-kW standby generator and automatic transfer switch (planned for 2005).

Sediment was removed from the Lined Pond and isolated areas of the geomembrane liner were repaired in 2003.

#### *West Fork Milo Creek Diversion*

The West Fork Milo Creek Diversion (the Diversion) was identified in the Bunker Hill Mine Water RI/FS (CH2M HILL, 2001a) as a viable mitigation to reduce AMD production in the Bunker Hill Mine. The objective of the Diversion project is to reduce the AMD volume requiring treatment at the CTP and, subsequently, the volume of sludge requiring disposal. The Diversion consists of collecting and piping surface water flow from the West Fork of Milo Creek around a near-surface fractured bedrock area of Milo Gulch and discharging this flow into the main stem of Milo Creek. The fractured bedrock allows the West Fork flows to readily infiltrate into underground mine workings and provide a water source for the production of AMD. The Diversion project is planned to be a pipeline about 2,700 feet long.

The USEPA is designing the Diversion project during 2005 and 2006 with an anticipated construction in 2006, pending funding approval for construction and a signed SSC amendment.

#### 4.3.8.4 Technical Assessment of Remedial Actions

Per USEPA guidance (USEPA, 2001b), technical assessment was conducted by evaluating the following three questions related to protectiveness of the implemented remedial actions:

***Question A: Is the remedy functioning as intended by the decision documents?***

The various remedial actions implemented at the CTP to date are functioning as designed and as intended by the decision documents. However, as previously stated, the overall CTP and mine water remedy is not yet complete. Therefore a complete assessment of this remedial action is premature and only the completed portions of the remedy are addressed in this five-year review report.

The CTP is currently required to meet the discharge requirements of its expired NPDES permit (USEPA, 1986). This permit expired on October 30, 1991; however, its discharge requirements have continued to be used by the USEPA until a long-term Total Maximum Daily Load (TMDL) is put in place for the SFCDR.

The expired permit establishes maximum discharge characteristics for the CTP outfall effluent. Daily composite samples are obtained from the CTP outfall to Bunker Creek and are tested for zinc, lead, cadmium, total suspended solids, and pH. Monitoring results are summarized each month and submitted to the USACE, to the USEPA Region 10 Water Division, and to the IDEQ. Discussions with the USACE indicate that the CTP consistently meets its discharge requirements with only occasional minor deviations from the effluent requirements. When deviations occur, standard procedures are to adjust the treatment plant operations as needed, and re-sample and re-test effluent quality to ensure compliance.

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the CTP remedial action.

Section 4.1.1 summarizes the ARARs review for the applicable OU2 decision documents. Of the changes to the ARARs summarized, the changes to the aquatic life criteria for wastewater treatment discharges (IDAPA 58.01.02.284) are applicable to the CTP.

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

No new information became evident as part of this five-year review that could call into question the protectiveness of the remedy.

As mentioned above, many components of the overall CTP remedy have not yet been implemented. Replacement of the unlined sludge ponds on the CIA is one particular component that could impact the protectiveness of the remedy by increasing infiltration through the CIA (see Section 4.3.4). The CTP continues to meet its expired NPDES permit with only minor occasional deviations. A standard process is in place to ensure that treatment plant effluent discharge requirements are met.

AMD is currently discharging from the Reed and Russel adits in Milo Gulch. These discharges eventually end up in Milo Creek. The mine owner is responsible for maintenance of in-mine flows and ensuring that AMD only discharges from the mine workings at the Kellogg Tunnel.

Until an SSC amendment is signed allowing for full implementation of the 2001 OU2 ROD Amendment, control and treatment of AMD and its impact on water quality will continue to be an issue. The USEPA and the State of Idaho continue to discuss the SSC amendment, and the long-term obligations associated with the mine water remedy.

### *Remedy Issues*

**Table 4-47. Summary of CTP Remedy Issues**

| Remedy Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **SSC for 2001 OU2 ROD Amendment:** Lack of an SSC amendment prevents full implementation of the 2001 OU2 ROD Amendment, including control of AMD into the CTP, additional CTP upgrades, and placing a new lined sludge pond on the CIA. | Y | Y |
| **AMD Discharge from Reed and Russel Adits**: Control of AMD discharge at the Reed and Russel adits. | Y | Y |

### *Recommendations*

**Table 4-48. Summary of CTP Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **SSC for 2001 OU2 ROD Amendment:** Continue, with the assistance of the State of Idaho, to pursue viable solutions to the SSC impasse. Once a solution is achieved, continue with implementation of the 2001 OU2 ROD Amendment. | IDEQ, USEPA | IDEQ, USEPA | 12/2007 | Y | Y |
| **AMD discharge from Reed and Russel:** Work with mine owner to address AMD conveyance issues resulting in discharge of AMD at these locations, | USEPA | USEPA | 12/2007 | Y | Y |

## 4.3.9 Bunker Creek

At the time of 1992 OU2 ROD preparation, Bunker Creek consisted of a man-made conveyance ditch that originated near the CTP and flowed west along the base of the CIA. It then angled north at the western end of the CIA before flowing into a culvert system beneath I-90 to its discharge point to the SFCDR (see Figures 4-1 and 4-6). Bunker Creek receives flow from several sources, including storm water drainage from a portion of western Kellogg, the Bunker Hill Mine yard, and the SCA; effluent discharge from the CTP; and surface water from Portal, Railroad, Deadwood and Magnet gulches.

#### 4.3.9.1 Review of ROD, ESD & ROD Requirements

Remedial actions required at Bunker Creek are presented in Table 4-49.

***Table 4-49. Bunker Creek Remedial Actions Required***

| ROD Requirement | Remedial Action Objective/Goal |
|---|---|
| **1992 OU2 ROD** | |
| Channelize and line Bunker Creek (Section 9.4) | Minimize infiltration through contaminated material and minimize releases to surface water |
| Treat base flows of Bunker Creek at the collected water wetland if water quality exceeds FWQC (Section 9.2.5) | Minimize releases to surface water |
| Remove PTM contaminated soils and dispose of in the PTM monocell (Section 9.2.5) | Prevent direct contact and minimize infiltration through contaminated media |
| Remove non-PTM contaminated soils with lead concentrations greater than 1000 mg/kg and dispose in the Smelter Closure (Section 9.2.5) | Prevent direct contact and minimize infiltration through contaminated media |
| **2001 OU2 ROD Amendment** | |
| Treat base flows of Bunker Creek at the CTP if water quality exceeds Ambient Water Quality Criteria (AWQC) | Changes treatment location for OU2 waters from collected water wetland to CTP |

The 1992 OU2 ROD specified that Bunker Creek was to be channelized and lined. The ROD did not specify the type of lining (i.e., compacted soil, geomembrane, concrete, etc.) nor the degree of liner permeability that was intended. In 1995, the State of Idaho conducted subsurface exploration (Spectrum Engineering, 1996) to determine the nature and extent of contamination in the Bunker Creek corridor as well as the general geotechnical properties of the underlying materials. Based on the subsurface exploration and the planned elevation of the creek bottom, it was decided by the USEPA and the State that the in-place soil had an existing permeability sufficiently low enough that a separate constructed lining for Bunker Creek was not necessary (CH2M HILL, 1996).

The 1992 OU2 ROD also stated that the Bunker Creek base flows were to be treated in the collected water wetland should sampling indicate exceedances of ambient water quality criteria (AWQC).

At the time the 1992 OU2 ROD was prepared, the collected water wetlands was to be constructed in the Smelterville Flats area. The April 1998 OU2 ESD clarified that because of a greater focus on source removals in Smelterville Flats and in other areas of OU2, consistent with the focus of Phase I remedial actions, the wetlands were not planned for immediate construction in the Flats. Based on studies conducted by the USBM between 1994 and 1998, the wetland treatment systems were found to be incapable of meeting treatment levels identified in the 1992 OU2 ROD. The 2001 OU2 ROD Amendment addressed treatment of site water originally slated for treatment in the constructed wetlands by requiring treatment at the upgraded CTP.

Surface water quality and quantity data are currently being collected as part of the OU2 water quality monitoring program. Currently, Bunker Creek water quality does not meet AWQC. Consistent with the Phase I/II remedy implementation strategy discussed in Section 4.1, if monitoring data over time indicate that the large-scale source removals conducted as part of Phase I Bunker Creek remedial actions have not resulted in the Bunker Creek water quality meeting AWQC, additional Phase II remedial actions may be necessary.

#### 4.3.9.2 Background and Remedial Actions Up to Year 2000

Aerial photography taken in the 1930s indicates that a natural drainage/wetland existed in the Bunker Creek area. Historical records show that uncontrolled dumping of coarse tailings, fine-grained tailings (slimes), mine waste rock, and granulated smelter slag occurred in the Bunker Creek corridor. Sampling and testing conducted during the RI showed that the corridor was moderately to highly contaminated. Lack of maintenance, sediment deposition from the tributary gulches, flow through underlying contaminated tailings, and discharge of AMD during treatment plant upsets all contributed to poor hydraulic performance and water quality degradation in the Bunker Creek corridor.

The Bunker Creek Phase I remedial action was conducted in 1996 and 1997. The major elements are presented in Table 4-50.

| Table 4-50. Bunker Creek Phase I Remedial Actions Prior to Year 2000 |
|---|
| Reconstructed approximately 7,600 linear feet of the creek channel, including a low flow channel and floodplain. The low flow stream channel was rocked for erosion protection and the floodplain was seeded. |
| Removed flotation slimes exposed at the surface of channel excavations to a depth of 2 feet below the slimes and backfilled to stream grade with clean compacted backfill material. |
| Disposed excavated slimes on the CIA. |
| Incorporated non-contaminated excavated material into the grading of the adjacent floodplain. |
| Installed culverts and riprap headwalls for three road crossings to maintain necessary site access over Bunker Creek. |
| Placed minimum 6-inch ICP barriers at the surface of all disturbed areas in the Bunker Creek corridor and hydroseeded. |

#### 4.3.9.3 Actions Since Last Five-Year Review

Bunker Creek Phase I remedial actions were essentially complete in 1997. Since the initial five-year review report was published in September 2000, the following additional work has been conducted as part of the Bunker Creek Phase I remedy:

- Riparian plantings of trees and shrubs along the creek corridor in 2001; and
- ICP capping in area west of CIA closure, completed in 2001.

#### 4.3.9.4 Technical Assessment of Remedial Actions

Per USEPA guidance (USEPA, 2001b), technical assessment was conducted by evaluating the following three questions related to protectiveness of the implemented remedial actions:

### *Question A: Is the remedy functioning as intended by the decision documents?*

The Bunker Creek Phase I remedy is functioning as intended by the decision documents. Specific aspects of the Phase I remedy performance evaluation are described below.

The initial five-year review reported that the Bunker Creek Phase I remedy was performing adequately, identified no issues, and listed the remaining work items of capping and emergency overflow as noted above. With the completion of the remaining work items and riparian planting in the creek corridor, the planned Phase I remedial actions for this site area are complete.

As part of this second five-year review report, the Bunker Hill corridor was inspected in October of 2004. The site inspection indicated that the Bunker Creek channel was stable, with soil caps remaining intact and serving to prevent direct contact with underlying contaminated soils. The vegetation on both the channel and adjacent areas is well established and is regenerating yearly without any maintenance. Culverts are free of sediment and debris.

Since the reconstruction of Bunker Creek channel, recontamination has occurred to certain segments of the channel due to a number of contributory factors. The primary factor is from direct discharge from the Bunker Hill Mine, as well as the plugging of its conveyance piping. Upon contact with creek water, some portion of the dissolved metals in the mine water precipitates from solutions and deposits sludge on the creek bottom. Other factors include occasional CTP upsets and contaminant transport from tributary creeks and adjacent surface areas. In response to recontamination, fencing was put in place between the creek and the Trail of the Coeur d'Alenes (Section 5.8) in 2002 to prevent direct human contact with contaminated sediments in the Bunker Creek Channel. In addition, part of the time-critical mine water upgrades the USEPA has implemented included construction of direct feed lines from the Bunker Hill Mine to the CTP and clean-out structures to ensure that piping and valves are working properly and conveying flows at intended capacities (see Section 4.3.8). Part of the ongoing maintenance of the CTP includes regularly scheduled pipe cleanout events that help remove flow constrictions from the plant direct and lined pond feed lines.

One item of concern noted in Bunker Creek site inspection was the presence of a beaver dam in Bunker Creek. Beavers have felled some of the trees planted during the 2001 riparian area planting adjacent to the channel and have built a small dam in Bunker Creek near the mouth of Magnet Gulch. Left unchecked, this beaver dam could eventually adversely impact creek flow (likely during high flow events), could cause damage to localized remediated areas surrounding the beaver dam, and could result in increased infiltration of Bunker Creek surface water through underlying contaminated soils to the upper aquifer. On the positive side, the presence of beavers in the Bunker Creek corridor indicates that the revegetation and habitat restoration measures of the remedy are attracting wildlife.

Based on the Phase I remedy goal of preventing direct contact by humans with underlying contaminants, the Phase I remedy for Bunker Creek is performing adequately.

The water quality of Bunker Creek is significantly influenced by the water quality of tributary creeks and other discharges (Portal, Railroad, Deadwood, and Magnet Creeks;

CTP discharge; storm water runoff from the City of Kellogg, Bunker Hill Mine yard, and the SCA). As stated earlier, currently base flows in Bunker Creek do not meet AWQC.

### Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the Bunker Creek Phase I remedial action.

Section 4.1.1 summarizes the ARARs review for the applicable OU2 decision documents. None of the new or revised standards identified in Section 4.1.1 call into question the protectiveness of the Bunker Creek Phase I remedy.

### Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

This five-year review did not find any new information that calls into question the protectiveness of the Bunker Creek Phase I remedy. It is not feasible to address the contamination in the channel until a SSC amendment is signed that allows for the full implementation of the 2001 OU2 ROD Amendment to prevent further recontamination of the creek channel.

### Remedy Issues

**Table 4-51. Summary of Bunker Creek Remedy Issues**

| Remedy Issues | Affects Protectiveness (Y/N) Current (now to 1 year) | Affects Protectiveness (Y/N) Future (>1 year) |
|---|---|---|
| **SSC for 2001 OU2 ROD Amendment:** Lack of a SSC amendment prevents full implementation of the 2001 OU2 ROD Amendment. Until the full 2001 OU2 ROD Amendment is implemented, cleanup of contaminated sediments in the Bunker Creek channel caused from mine and tributary flows and minor CTP upsets is not feasible. | Y | Y |
| **Ambient Water Quality Standards:** Bunker Creek base flows do not currently meet AWQC. | Y | Y |
| **Beaver Dam:** Presence of the beaver dam may impact channel stability, flow paths, and infiltration. | N | Y |

### Recommendations

**Table 4-52. Summary of Bunker Creek Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) Current (now to 1 year) | Follow-up Actions: Affects Protectiveness (Y/N) Future (>1 year) |
|---|---|---|---|---|---|
| **SSC for 2001 OU2 ROD Amendment:** Continue, with the assistance of the State of Idaho, to pursue viable solutions to the SSC impasse. Once a solution is achieved, continue with implementation of the 2001 OU2 ROD Amendment. | IDEQ, USEPA | USEPA | 12/2007 | Y | Y |

| Table 4-52. Summary of Bunker Creek Recommendations and Follow-Up Actions | | | | | |
|---|---|---|---|---|---|
| | | | | Follow-up Actions: Affects Protectiveness (Y/N) | |
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Current (now to 1 year) | Future (>1 year) |
| **Bunker Creek Phase 1 Remedial Action Effectiveness Monitoring:** Complete evaluation of the Phase I remedial action effectiveness monitoring data and revise the remedial action effectiveness monitoring plan as appropriate. | IDEQ, USEPA | IDEQ, USEPA | 7/2006 | N | Y |
| **Beaver Dam:** Coordinate with Idaho Department of Fish and Game (IDFG) on appropriate measures to address beaver presence. | IDEQ, USEPA | IDEQ, USEPA | 12/2005 | N | Y |

## 4.3.10 Union Pacific Railroad Right-of-Way (PRP Action)

There were two distinct response actions implemented by the UPRR on their ROW, which stretches over 71.5 miles between Plummer and Mullan, Idaho. The larger-scale removal action was conducted between 2000 and 2004 and focused on the ROW that was outside of the Box; information on that action can be found in Section 5.8 (Trail of the Coeur d'Alenes) of this report. The smaller-scale remedial action was conducted in the Box in 1997 and 1998 and is described in this section.

The remedial action in OU2 was conducted by the UPRR with oversight by the IDEQ and the USEPA pursuant to a CD.[7] The ROW extends approximately 7.75 miles and runs east/west through the Box (see Figure 4-1). The width of the UPRR ROW ranges from 60 to 200 feet. The Engineering Evaluation/Cost Analysis (EE/CA) notes that the UPRR commenced proceedings to abandon the Wallace and Mullan Branches in 1991 (USEPA, 1999). The Interstate Commerce Commission (ICC), by its initial decision in October 1992 and its subsequent decision in 1994, authorized cessation of rail service. The Wallace-Mullan Branch of the UPRR, including the portion that runs through the Box, was subsequently taken out of service and is now being maintained by the UPRR and managed by Idaho Department of Parks and Recreation (IDPR) and the Coeur d'Alene Tribe as part of the larger Trail of the Coeur d'Alenes rails-to-trails recreational facility.

The rail line was originally constructed in the late 1800s and used to transport mining and milling products to and from the Coeur d'Alene River Valley. Mine tailings and waste rock were prevalent throughout the valley from the mining activities that date back to the 1880s. In portions of the UPRR ROW, these lead-bearing materials were used in the construction of the original rail bed. Lead-bearing mine tailings and concentrates may also have been deposited on portions of the UPRR ROW from historical flood deposition from the SFCDR, as well as from occasional spillage from the rail cars.

[7] Consent Decree; Bunker Hill; United States of America and State of Idaho v. Union Pacific Railroad Company; Stauffer Management Company; Rhone-Poulenc; Civil Action No. 95-0152-N-HLR; March 24, 1995.

### 4.3.10.1 Review of ROD, ESD & ROD Requirements

Much of the UPRR ROW is located in the non-populated area of the Site; however, portions of the UPRR ROW are adjacent to populated areas such as commercial and residential areas of Smelterville and Kellogg (see Figure 4-1). The OU2 ROD specified that remedial actions for ROWs in residential areas must meet the requirements of the OU1 ROD (USEPA, 1991). Remedial actions specified in the 1992 OU2 ROD are summarized below in Table 4-53.

**Table 4-53. UPRR Remedial Actions Required by 1992 OU2 ROD (Section 9.2.6)**

| Remedial Actions | Remedial Action Objectives/Goals | Success Criteria |
|---|---|---|
| **UPRR in Populated and Non-Populated Areas** | | |
| Temporary dust control | Minimize lead exposure from fugitive dust | Meet ambient air criteria |
| Enforce existing controls on access | Prevent direct exposure to contaminated soil | Reduce the potential for unauthorized access |
| Maintain existing fencing | Prevent direct exposure to contaminated soil | Reduce the potential for unauthorized access |
| Institutional controls | Prevent direct exposure to contaminated soil | Reduce the potential for accidental exposure |
| Permanent dust control through containment, "hot spot" removal, soil/rock barriers, and revegetation | Minimize lead exposure from fugitive dust | Meet ambient air criteria |
| **Additional Action for UPRR Adjacent to Residential Areas** | | |
| Treat consistent with the remedial action selected in the Residential Soils ROD | Minimize lead exposure from fugitive dust; prevent direct exposure to contaminated soil | Meet ambient air criteria; reduce the potential for accidental exposure |

The 1991 OU1 ROD set a threshold level for lead concentrations in soils of 1,000 mg/kg. Criteria for removal and replacement of soil according to the ROD are as follows:

- If the 0- to 1-inch or 1- to 6-inch depth intervals exceed the threshold level, 6 inches of contaminated material will be excavated and replaced. In addition, if the 6- to 12-inch interval exceeds the threshold level, another 6 inches (total of 12 inches) will be removed and replaced. If the 6- to 12-inch interval does not exceed the threshold level, only a 6-inch excavation and replacement will be done.

- In the case where the 6- to 12-inch depth interval exceeds the threshold level but the 0- to 1-inch and the 1- to 6-inch intervals do not, 12 inches of material will be excavated and replaced.

- If the 0- to 1-inch and the 1- to 6-inch and the 6- to 12-inch intervals do not exceed the threshold level, the property will not be remediated.

The 1997 Implementation Plan (MFG, 1997) stated that the 1992 OU2 ROD required removal of any process material from the UPPR ROW with measured lead concentrations exceeding levels typically associated with mine tailings or waste rock. In accordance with this requirement, ore concentrates, ballast, and soils with lead concentrations exceeding 30,000 mg/kg lead and not attributable to mine tailings or waste rock were excavated from the UPRR ROW and disposed of in the CIA. In addition, all portions of the UPRR ROW with lead concentrations in excess of 1,000 mg/kg in the top 12 inches (or 6 inches, depending on location) of ballast or soil were to receive either barrier placement, removal and replacement (to maintain drainage), revegetation, and/or access control, depending on geographic location and current land use.

#### 4.3.10.2 Background and Remedial Actions Up to Year 2000

Under an agreement with the USEPA and the State of Idaho, some portions of the UPRR ROW were remediated by the USEPA and the State (Government response areas) in exchange for use of the ROW for construction of a haul road to transport mine tailings from Smelterville Flats to the CIA. Other portions of the ROW were remediated by the UPRR as part of their CD with the USEPA. Remediation of the UPRR ROW extended from 1995 through 1999; remediation activities are described in Table 4-54.

| Table 4-54. UPRR ROW Remediation Prior to Year 2000 |
|---|
| Areas of spilled ore concentrates ("hot spots") were identified, removed, and transported to the Smelter Complex for eventual disposal. |
| Rails, ties, and other track material were removed prior to ballast and soil excavation; decontaminated materials were shipped offsite for reuse; contaminated or unusable materials were placed in the CIA closure. |
| After rail and tie removal, excavation occurred in the UPRR ROW from Elizabeth Park on the east side of the site to where the UPRR goes beneath I-90 near the Pinehurst Narrows to the west. |
| Clean gravel or soil barriers (less than 100 mg/kg lead or arsenic; less than 5 mg/kg cadmium) were placed throughout the UPRR corridor from Elizabeth Park to Enaville except where steep terrain or heavy vegetation restricted application. |
| Although not required as part of the UPRR remedial action, portions of the UPRR ROW from Smelterville through Kellogg to Elizabeth Park (Kellogg Greenbelt Project) were paved as part of trail construction. |

#### 4.3.10.3 Actions Since Last Five-Year Review

***2000***

The USEPA began the remediation of the portions of the UPRR ROW adjacent to the CIA haul road in 2000. Verification sampling followed remediation activities.

***2001***

Additional cover material was added to the deficient areas of the UPRR ROW that were discovered during the 2000 five-year review sampling event. Government certification of the remedy on the UPRR ROW in OU2 took place in December 2001. This followed completion of the remaining work outlined in the previous five-year review, submittal and acceptance of the *Post-Closure Operations and Maintenance Plan* (MFG, 2001b), and other pre-certification requirements (construction completion report, pre-certification walk-through, pre-certification report, certification completion report). Certification of the UPRR ROW corridor within the Box boundaries triggered the incorporation of this area into the ICP. In accordance with the UPRR CD, a negotiated settlement was provided to the State of Idaho to fund the ICP program oversight of the UPRR corridor.

***2002 to 2004***

Some small segments of the trail barrier at specific road crossings remained to be completed when the previous five-year review was written. The crossing segments that remained to be completed were: access to the CIA between Smelterville and Government Gulch, east of Government Gulch Road adjacent to McKinley Avenue, and near the west side of the Concentrator Area. Each of these crossings has since been paved and the road crossing near the Concentrator Area crossing was abandoned.

An old fuel bulk plant on the UPRR ROW in Kellogg was removed and remediated in 2004 under the oversight of the IDEQ. This facility was operated by a lessor of UPRR ROW for many years. During the original remediation of the UPRR ROW, this facility was operational, so minimal remediation occurred due to the inaccessibility of the area.

An asphalt path was not part of the obligation of the UPRR as negotiated and documented in the CD. However, the City of Kellogg paved large segments of the UPRR ROW between Smelterville and Elizabeth Park with asphalt during the Kellogg Greenbelt recreational trail development prior to the last five-year review. Funds for that paving were obtained by the City from non-UPRR sources. A 10-foot-wide asphalt recreational trail was extended through the remaining segments in OU2 in 2002 to coincide with the Trail of the Coeur d'Alenes (UPRR Wallace-Mullan Branch removal action) outside of the Box. The Kellogg Greenbelt trail segment is managed by the City of Kellogg and is expected to remain so after the ownership of the trail is transferred. A management agreement will be negotiated between IDPR and the City of Kellogg for this segment.

***2005***

In 2005, the USACE remediated two discrete areas along the UPRR ROW:

- An area east of Ross Ranch and south of the ROW; and
- A haul road shoulder area south of the current TCI building.

In addition, the USACE will remediate bare patches along the OU2 portion of the ROW between the meandering trail and the fence in late 2005 or early spring 2006.

#### 4.3.10.4 Operations and Maintenance

Operation and maintenance activities for the UPRR ROW have been conducted since the early spring of 2002 as agreed upon following certification of the UPRR ROW in 2001 and acceptance of their *Post-Closure Operations and Maintenance Plan* (MFG, 2001b). Repairs have been made, as necessary, to the barriers based on the findings during these and other inspections required in the plan. These repairs have included replacement of clean barrier gravel material displaced during flooding events, removing debris in culverts, and installation of fencing and other barriers to restrict access to motor vehicles using the right-of-way which caused erosion of the barriers. The IDPR manages this section of the trail within the OU2 boundary and conducts oversight of operation and maintenance activities. The IDPR assumed management responsibilities in 2002. Management activities on the entire Trail of the Coeur d'Alenes are explained in more detail in Section 5.8 of this report.

#### 4.3.10.5 Technical Assessment of UPRR Remedial Action

Per USEPA guidance (USEPA, 2001b), technical assessment was evaluated by responding to the following three questions related to protectiveness of the implemented remedial actions:

### *Question A: Is the remedy functioning as intended by the decision documents?*

Generally, the remedy is functioning as intended by the 1992 OU2 ROD and the UPRR CD. The gravel barriers are susceptible to noxious and non-noxious vegetation infestation as are any open land areas throughout eastern Washington, northern Idaho, and western Montana. No noxious weed treatment was negotiated, nor have any known weed control actions been implemented for this rail-line remediation. While this section of the trail traverses the residential communities of Kellogg and Smelterville, it also traverses some larger parcels of uninhabited ground that make it susceptible to unauthorized vehicle access. Some of the gravel barriers erode with vehicle traffic and water, which could affect the protectiveness of the OU2 Selected Remedy. Continued maintenance of established asphalt and concrete barriers is an important issue. Some asphalt and concrete barriers, mostly within the City of Kellogg, were in place prior to the 1996 remedy implementation. Without maintenance, these barriers will be susceptible to degradation and eventually will need to be either repaired or replaced; otherwise, the remedy in these areas will not be protective. Newly asphalted areas associated with the Kellogg Greenbelt and the entire trail in the OU2 boundary has increased the durability and stability of the barriers in those areas.

### *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?*

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. None of the standards identified in Section 4.1.1 are ARARS or potential ARARs for the UPRR ROW remedial action remedy.

### *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

This five-year review did not find any new information that calls into question the protectiveness of the UPRR ROW remedy.

### *Remedy Issues*

Long-term barrier management and protection of the UPRR ROW in the Box falls under the auspices of the ICP and the potential for recontamination is minimized. The noxious weed issue is not covered by the ICP and does not represent a threat to the barrier protectiveness, but tends to be a nuisance issue and will need to be separately addressed through management operations, as stated above. Erosion caused by motor vehicle access on the ROW continues to be an issue.

**Table 4-55. Summary of UPRR Remedy Issues**

| Remedy Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **Barrier Erosion:** Motor vehicle access on gravel portions of the UPRR ROW results in erosion of barrier layers. | N | Y |

### *Recommendations*

**Table 4-56. Summary of UPRR Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Barrier Erosion:** Continue oversight monitoring of UPRR's O&M program. | IDEQ, PHD | IDEQ, PHD | 9/2010 | N | Y |

## 4.3.11 Milo Gulch (including Reed Landing)

### 4.3.11.1 Review of ROD, ESD & ROD Requirements

Requirements for Milo Gulch are summarized in Table 4-57, as found in the first five-year review report for OU2 (USEPA, 2000a) and the 2001 OU2 ROD Amendment (USEPA, 2001a).

**Table 4-57. Milo Gulch Remedial Actions Required**

| ROD Requirement | Remedial Action Objective/Goal |
|---|---|
| **1992 OU2 ROD** | |
| Channelize and line Milo Creek from the Wardner Water System intake to the culvert that directs flow beneath Wardner and Kellogg (Sections 9.2.1 and 9.2.5) | • Minimize contact between Milo Creek surface water, tailings, and waste rock on the gulch floor.<br>• Reduce contaminant transport to the SFCDR as suspended sediment in runoff events.<br>• Minimize surface water infiltration into the underlying Bunker Hill Mine workings. |
| **1998 OU2 ESD** | |
| Financial contribution by the USEPA to the reconstruction of the underground Milo Creek pipeline project beneath Wardner and Kellogg | Minimize the potential for recontamination of previously remediated residential yards. |
| **2001 OU2 ROD Amendment** | |
| Acid mine drainage source control to reduce quantity of surface water entering the mine and AMD created within the mine. Includes West Fork Milo Creek Diversion, rehabilitation of Phil Sheridan Raise, and plugging in-mine drill holes. | Reduce quantity of AMD created in mine, reduce long-term AMD management costs, improve surface water quality in Bunker Creek and South Fork of the Coeur d'Alene River. |

The original work scheduled for Milo Creek was to be conducted by the PRPs. The cleanup plan was renegotiated in 1993-94 between the State and the USEPA following the bankruptcy of the major PRP committed to fund Milo Gulch work.

### 4.3.11.2 Background and Remedial Actions Up to Year 2000

Milo Creek drains an approximately 4-square-mile watershed located above and within the towns of Wardner and Kellogg, and eventually discharges into the SFCDR (see Figure 4-1). For the purposes of this five-year review document, the Milo Creek watershed will be discussed in three segments: the upper watershed, the lower Milo Creek piping system beneath the towns of Wardner and Kellogg, and Reed Landing.

### *Upper Milo Watershed*

The upper Milo Creek watershed (Figure 4-11) comprises about 2 square miles and consists of forested and clear-cut areas, the Silver Mountain Ski Resort, mine dumps, and some industrial mining areas (the Reed Landing). In the upper reaches of the basin, there are three forks of Milo Creek (West, South, and Upper) that join to form the main stem of Milo Creek. Prior to the remediation activities and infrastructure improvements discussed in this report, Milo Creek flowed in a steep, narrow canyon with heavy bedload (sediment, gravel, and rocks transported downstream by the force of water). The watershed crest at Wardner Peak is at approximately 6,300 feet above mean sea level (amsl) and drops to 2,300 feet amsl in Kellogg.

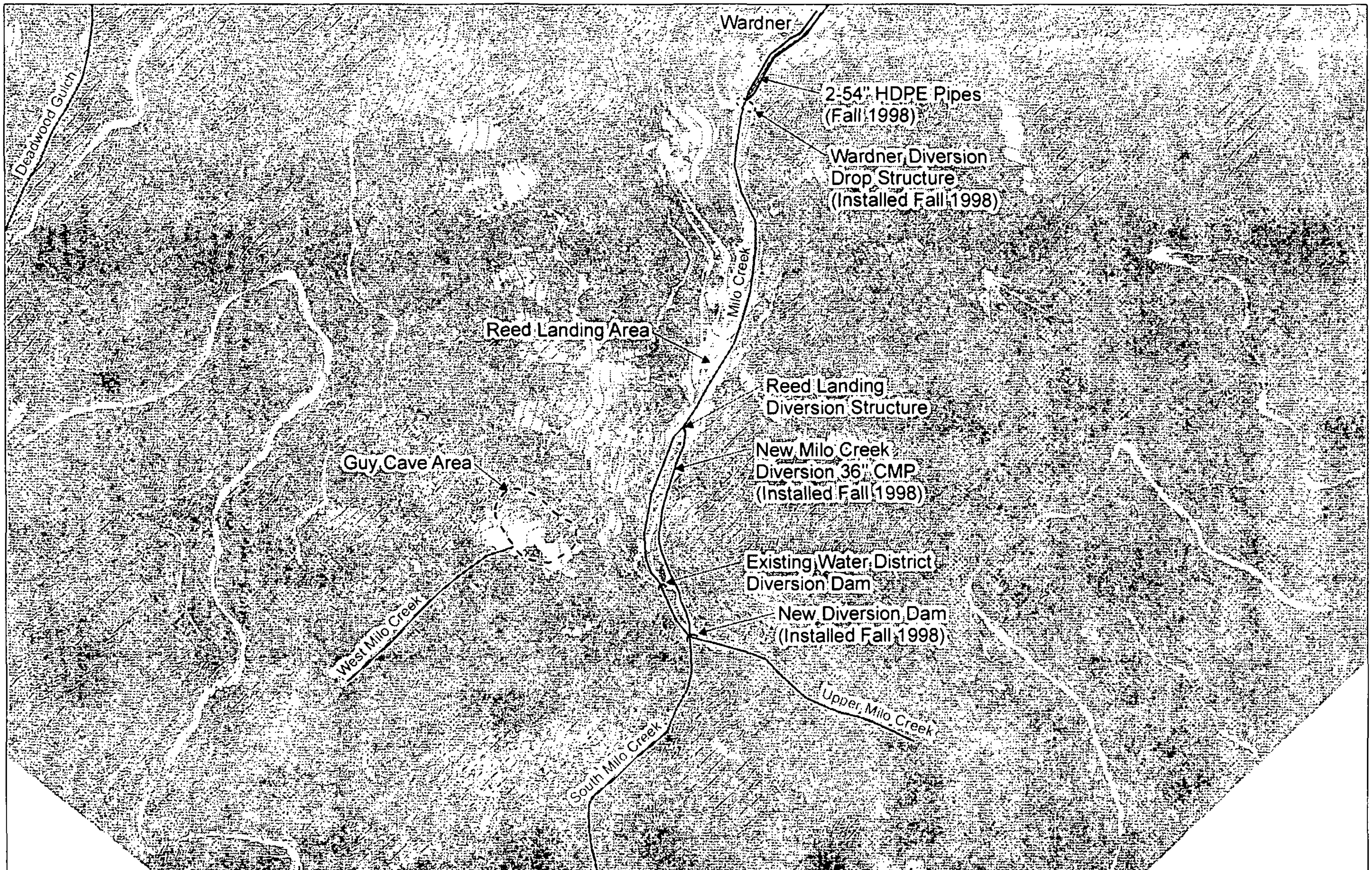
Historically, the upper Milo Creek watershed primarily supported mining and logging. Mine dumps, portals, access roads, hoists, and other industrial mining features are located throughout this area and have impacted Milo Creek's water quality and discharge over the years. A large surface depression resulting from underground block-caving mining techniques is located in the western portion of the upper Milo watershed and is referred to as the Guy Cave Area. West Milo Creek flows into this surface depression and drains into the underground mine workings. In addition, several faults are located in the upper Milo watershed and cross the various forks of Milo Creek. It is believed that these fault zones and the close proximity of the extensive mine workings beneath this area result in significant surface water infiltration into the mine workings. This clean surface water is then altered through chemical reactions with pyrite and oxygen to acid mine drainage that eventually requires treatment at the CTP.

During the 1997 flood event that caused substantial damage to the downstream infrastructure for Milo Creek, debris overwhelmed the backhoe's ability to keep the trash rack clear and overtopped the culvert. Discussions with workers at the scene suggested that debris accumulation, not flood water, was the major cause of problems at the Reed Landing.

This observation was never validated with flow data and capacity correlations; however, it was evident that the 4x4 culvert was in a state of disrepair and was failing as substantiated by sink holes. The mine owner repaired one culvert roof cave-in, consistent with his responsibilities as the owner and operator of the Bunker Hill Mine.

### *Lower Milo Creek Piping System*

A second trash rack existed in Milo Creek approximately 300 feet above the town of Wardner to screen excessive bedload prior to flow entering a 48-inch corrugated metal pipe system that conveyed Milo Creek beneath Wardner and Kellogg. This rack was located near a heavily contaminated historic mill site. The City of Wardner staged a backhoe at the pipe intake during flood events to remove accumulated debris from the trash rack.




**Legend**

—— Water Features

N

0 500 1,000 Feet

FIGURE 4-11

**OU2 MILO GULCH AND REED LANDING**

**BUNKER HILL SUPERFUND SITE**

FIVE-YEAR REVIEW

File Path: Z:\USEnvironmentalProte\321104\GIS\MapDocuments\Mxds\5-Year Review\Figure 4-11.mxd

As Milo Creek entered the town of Wardner at the lower trash rack, it flowed underground through a combination of open channels, 48-inch concrete pipe, 48-inch corrugated metal pipe, and 4-foot by 4-foot box culverts. The entire flow of Milo Creek was totally contained throughout Kellogg by similar piping materials. Due to the dilapidated and poor condition of this system, a severe flood occurred during a major runoff event in May 1997. Debris accumulations plugged the trash racks and high flows overwhelmed the conveyance system, which eventually resulted in failure of the Milo Creek subsurface conveyance structures downstream in Kellogg. Heavy bedload and debris plugged culvert and pipe systems and resulted in several blowouts of culverts, pipe failures, and the creation of sinkholes. In addition, lead-contaminated surface water and sediment flooded through many properties and recontaminated areas that had previously has residential soils remediated as part of the OU1 ROD (see Section 3 for more detailed information on the residential remediations). The affected properties were re-remediated by the Federal Emergency Management Administration (FEMA) and Idaho Bureau of Disaster Services (IBDS) under a Presidential Declaration.

After the 1997 flood, a basin was excavated in front of the intake to improve debris management. In 1998, a permanent concrete sediment basin was installed and connected to a new high-density polyethylene (HDPE) conveyance system that replaced the corrugated metal pipe. This new basin traps sediment and bedload, allows floating debris to be collected and removed, and directs stream water into twin 54-inch HDPE pipes through Wardner and Kellogg. Remediation actions in Milo Gulch before 2000 are presented in Table 4-58.

| **Table 4-58. Milo Gulch Remediation Prior to Year 2000** |
|---|
| 1995: ~ 30,000 cy of mine waste rock and tailings removed from creek banks above Reed Landing and placed in Guy Caves area by Bunker Hill Mine owner. |
| Areas in Kellogg recontaminated after 1997 flood were remediated by the Federal Emergency Management Administration (FEMA) and Idaho Bureau of Disaster Services (BDS) under a Presidential Declaration. |
| A water diversion dam and pipeline was built in 1999 on the main stem of Milo Creek to minimize contact between Milo Creek surface water and tailings/mine waste rock on the valley floor and to reduce infiltration into the mine workings that underlie the stretch of Milo Creek between the confluence with the South Fork of Milo Creek and Reed Landing. Milo Creek flow was piped down to a new piping system beneath the towns of Wardner and Kellogg. |

### *Reed Landing*

The Reed Landing consists of a mine tailings dump obstructing the Milo Creek flow path, located midway up the watershed, which was filled in the early days of the Bunker Hill Mine Complex operations. Prior to 1998, a 4-foot by 4-foot concrete box culvert (4x4 culvert) conveyed Milo Creek through the dump or "landing." A trash rack screen made of railroad rails was placed over the entrance of the box culvert to prevent oversize materials from entering it. When the screen plugged or the capacity of the 4x4 was exceeded, the flows ran overland across the mine dump and spilled over a failing wooden timber crib retaining wall at the face of the dump. During flood events, a backhoe was used to remove debris from the trash rack to ensure that water could enter into the culvert. These actions and other remediation activities before 2000 at Reed Landing are presented in Table 4-59.

| Table 4-59. Reed Landing Remediation Prior to Year 2000 |
|---|
| Removal of the failing timber crib retaining walls and regrading the nearly vertical face of the landing to at least 2 horizontal to 1 vertical (2H:1V). Haul majority of spoils to the CIA smaller quantity used as in-fill at Guy Cave. This was necessary to prevent the transport of contaminants downstream and recontamination of residential homes and commercial places of business. |
| Construction of a reinforced concrete overflow channel across the Reed Landing dump with the capacity to convey a 100-year recurrence interval storm event. This open channel configuration was chosen to allow for ease of access and cleanout given its significant conveyance capacity. |
| A stilling basin was constructed at the downstream end of the channel to dissipate energy prior to the creek entering a newly constructed 700-foot long riprap lined channel that joined the existing Milo Creek drainage. |
| Construction of incidental items such as debris trash-racks and debris basins on the upstream end of Reed Landing to prevent the system from clogging with debris and to allow ease of maintenance. |

### 4.3.11.3 Actions Since Last Five-Year Review

No remedial actions have been conducted since 2000. However, there are additional remedial actions called for in the 2001 OU2 ROD Amendment (USEPA, 2001a) to address the infiltration into the underground mine workings. Remedial design for the West Milo Diversion project is currently being conducted by the USEPA and is anticipated to be completed in 2006. Implementation of this project is planned for 2006, pending a SSC amendment. In addition to the West Milo Diversion project, other remedial actions called for in the 2001 OU2 ROD Amendment include: rehabilitating the Phil Sheridan Raise and plugging in-mine drill holes to reduce the quantity of surface water entering the mine and acid mine drainage creation within the mine.

### 4.3.11.4 Operations and Maintenance

A watershed district was formally established in 1998 by a vote of people residing in Kellogg and Wardner. Sediment removal at the Wardner structure and Upper Milo was paid for by the State of Idaho while the watershed district was in its infancy. The State of Idaho also paid to connect a storm drain to the Wardner structure to remove a large steel plate left in the Washington structure and to connect a storm drain to the Milo system in lower Kellogg.

The watershed district, which is managed by three directors, has the responsibility to conduct regular O&M activities as necessary to ensure the Milo Gulch stormwater control system continues to function as designed. Funding for the activities is provided by annual property assessments. A draft formal O&M plan has been prepared by the USACE that includes:

- Periodic inspection and clean-out of culverts, sedimentation basins, and diversion structures;
- Inspection of the entire gulch after major storm events;
- Inspection, and repair if necessary, of damage to channels or structure;
- Inspection, and repair if necessary, of fences and other safety features; and
- Inspection, and repair if necessary, of maintenance access routes.

In addition to the O&M Plan, the USACE has been negotiating permanent access to the site to allow O&M activities to be conducted as necessary. Those negotiations have been stalled as the mine owner has launched a legal action against the USEPA for construction of the Reed Landing Drainage Enhancement Project. Access negotiations have been suspended pending resolution of the legal action.

Consistent with the rest of the site, O&M activities will be conducted by the State of Idaho as required under CERCLA to ensure remedy performance.

The tax assessments mentioned above have occurred over the last 3 years, producing a total of about $9,000 (or $3,000 per year). Within this limited funding source, only simple maintenance activities can be conducted. To date, only sediment removal at the Wardner Structure and Upper Milo Structure has occurred. Impacts to the system from surrounding mine dumps, acid water, tailings, upper watershed erosion, and bedload cannot be addressed through this mechanism. Also, Milo Creek system modifications that result from changes in hydrology due to development or remedial actions cannot be achieved through the watershed district.

No records regarding funding, inspection, or maintenance activities for the Milo Creek stormwater system have been reviewed or evaluated.

#### 4.3.11.5 Technical Assessment of Milo Gulch Remedial Actions

Per USEPA guidance (USEPA, 2001b), technical assessment was conducted by evaluating the following three questions related to protectiveness of the implemented remedial actions:

##### *Question A: Is the remedy functioning as intended by the decision documents?*

As noted above, the Milo Gulch remedies were constructed between 1995 and 2000. The performance of drainage systems such as those installed in Milo Gulch and at the Reed Landing require a period of years to evaluate for effectiveness as the system incurs varying storm events. To date, moderate (5-year) storms have occurred and the system has performed as designed.

After 5 years of performance, the hydraulic systems, including pipes and open channels, have required minimal O&M efforts. Channel side-slopes and channel inverts have remained stable. It is unknown if internal piping inspections have been performed. Sediment accumulation has been minimal, reflecting the stabilized channels. Water quality monitoring has shown a decrease in particulate lead. However, dissolved zinc levels have not shown appreciable change. This issue is discussed in more detail in Section 4.4.1.

##### *Question B: Are the exposure assumptions, toxicity data, and cleanup levels, and RAOs used at the time of the remedy selection still valid?*

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy remain valid for the Milo Gulch remedial actions.

A summary of the ARARs review for OU2 decision documents is found is Section 4.1.1. None of the new or revised standards identified in Section 4.1.1.1 are ARARs or potential ARARs for the Milo Gulch remedial actions.

### *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

While new information has been gathered and new actions determined, they do not call into question the protectiveness of the remedy, but serve to supplement it. Between 1998 and 2001, the USEPA and the State of Idaho conducted an RI/FS to evaluate additional remedial actions that may be implemented in the upper Milo basin to further reduce surface water infiltration into the underlying mine workings. The potential additional remedial actions focus on diverting the surface water flows of the west fork of Milo Creek around existing fault zones and bypassing the Guy Cave area. The 2001 OU2 ROD Amendment was issued based on this RI/FS and requires additional remedial actions in upper Milo Gulch to address the infiltration into the underground mine workings, as well as, upgrades to the CTP and new sludge disposal cells. The latter remedial actions are discussed in sections 4.3.4 and 4.3.8.

To date, the USEPA and the State of Idaho have not concluded negotiations on a SSC amendment that allows for full implementation of this ROD amendment. Until this SSC amendment is signed, the USEPA cannot use remedial action funds to implement the remainder of the mine water remedy, including the surface water mitigation work identified for Milo Creek.

It was noted during field inspections of the site in October 2004 by CH2M HILL and the USEPA, that mine adit drainage and the community drinking water system overflows were flowing into an old surface water inflow point that leads into the 4'x4' box culvert, eventually daylighting on a steep slope adjacent to the concrete conveyance channel. These flows have the potential to undermine the stability of the channel on this slope, as well as slopes downstream. Since the inspections, discussions with the Water District have resulted in a diversion of the overflows into the conveyance system, eliminating the risk posed by these flows. The flows from the mine adits are still a risk to the system and need to be addressed.

### *Remedy Issues*

**Table 4-60. Summary of Milo Gulch Remedy Issues**

| Remedy Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **SSC for 2001 OU2 ROD Amendment:** Lack of a SSC amendment prevents full implementation of the 2001 OU2 ROD Amendment, including surface water mitigation work identified for Milo Creek. | Y | Y |
| **Reed Landing Adit Flows:** Near Reed Landing, adit drainage flows into an old surface water channel and into the buried 4x4 culvert, and eventually daylights onto a soil slope. Slope instability or erosion may occur as a result of this flow. | N | Y |
| **System Requirements**: System requires periodic maintenance to control function. | N | Y |

### *Recommendations*

**Table 4-61. Summary of Milo Gulch Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **SSC for 2001 OU2 ROD Amendment:** Continue, with the assistance of the State of Idaho, to pursue viable solutions to the SSC impasse. Once a solution is achieved, continue with implementation of the 2001 OU2 ROD Amendment. | IDEQ, USEPA | USEPA | 12/2007 | Y | Y |
| **Reed Landing Adit Flows:** Continue discussions/negotiations with the mine owner to redirect the adit flows in the Milo drainage to the CTP for treatment. | USEPA | USEPA | 12/2005 | N | Y |
| **Permanent Access**: Secure permanent access for system maintenance. | IDEQ, USEPA | USEPA | 9/2010 | N | Y |

## 4.3.12 A-4 Gypsum Pond Closure (PRP Action)

The A-4 Gypsum Pond is located in the central region of OU2 near the mouth of Magnet Gulch. It is bounded on the west by McKinley Avenue and Magnet Gulch, on the east by Deadwood Gulch, on the south by McKinley Avenue, and on the north by Bunker Creek. The site encompasses an area extending 1,600 feet from east to west and 550 feet from north to south.

The gypsum contained in the A-4 Gypsum Pond was produced between 1964 and 1970 as a waste byproduct during production of phosphoric acid at the Phosphoric Acid/Fertilizer Plant in Government Gulch. The material is predominantly calcium sulfate ($CaSO4$) with traces of impurities.

Physical data collected during the Bunker Hill RI indicated that the maximum depth of gypsum is approximately 37 feet. The floor of the pond slopes gently downward from the McKinley Avenue road embankment at the southern boundary of the pond north towards Bunker Creek. The gypsum is contained on the north by a constructed embankment composed of mine waste rock that is 40 to 50 feet above the valley floor and extends approximately 5 to 10 feet above the gypsum surface. The slope of this embankment is 2:1, with the toe of the slope ending approximately 100 feet from Bunker Creek. Based on extrapolation of adjacent topography, the volume of gypsum in the A-4 Gypsum Pond is estimated to be approximately 500,000 to 800,000 cubic yards (MFG, 1992b).

### 4.3.12.1 Review of ROD, ESD & ROD Requirements

Table 4-62 describes the required remedial actions at Gypsum Pond based on the ROD.

| Table 4-62. A-4 Gypsum Pond ROD Required Remedial Actions | |
|---|---|
| ROD Requirement | Remedial Action Objective/Goal |
| **1992 OU2 ROD (Section 9.2.5)** | |
| Low maintenance rock and/or soil barrier on A-4 Gypsum Pond or relocate to CIA. | Limit direct contact with contaminants and control migration of contaminants to surface water, groundwater and the air.<br>Minimize infiltration through the gypsum material. |
| Re-vegetate disturbed areas. | Minimize direct contact and migration of contaminants. |

### 4.3.12.2 Background and Remedial Actions Up To 2000

The principal objective of the A-4 Gypsum Pond remedial action was to reduce or eliminate contaminant migration from the pond to groundwater, surface water, and the air. To accomplish this, the 1992 OU2 ROD required either the relocation of the pond to the CIA or capping of the gypsum in place with a low-maintenance rock or soil barrier.

The final decision was to close the A-4 Gypsum Pond in place. This decision was based upon the engineering feasibility of capping the pond and additional consideration of groundwater and surface water hydrology in that area. [8] Subsequent remedial design reports (RDRs) and remedial action work plans (RAWPs) prescribed the specific remedial actions that were to be conducted and performance standards that were to be met in order to achieve ROD requirements and objectives (MFG, 1996a and 1996b).

The Stauffer Management Company (SMC) initiated remedial actions in 1996. Table 4-63 summarizes the major remedial actions completed through the year 2000.

| Table 4-63. A-4 Pond Remediation Completed Prior to Year 2000 |
|---|
| Constructed run-on ditches along the up-gradient perimeter of the closure area to intercept and divert localized drainage away from the closure surface area. |
| Capped approximately 13 acres of the closure surface area. The soil was salvaged from the Borrow Area Landfill. |
| Removed the upper portion of the existing north perimeter embankment and regraded the downstream face of the embankment to achieve a slope of 2 (horizontal) to 1 (vertical). |
| Rerouted Magnet Creek over the A-4 Pond through a geomembrane-lined channel. After problems with the above channel lining were encountered, it was decided to excavate and lower the Magnet Gulch channel down to the native soils at the floor of the tailings pond. Excavated gypsum was placed and re-graded on top of the closure area. |
| Installed a seepage barrier along the north perimeter of McKinley Pond (south of McKinley Ave), and a new culvert under McKinley Avenue from McKinley Pond, with related headwalls and discharge apron to direct and control outflow from the pond area into Magnet Gulch channel. The culvert was sealed to control leakage from McKinley Pond. |

[8] Consent Decree; Bunker Hill; United States of America and State of Idaho v. Union Pacific Railroad Company; Stauffer Management Company; Rhone-Poulenc. Civil Action No. 95-0152-N-HLR; March 24, 1995; *Statement of Work for A-4 Gypsum Pond Subarea, Bunker Hill Remedial Design and Remedial Action;* December 1994.

### 4.3.12.3 Actions Since Last Five-Year Review

A number of remedial actions were identified in the first five-year review that still needed to be completed. Table 4-64 summarizes those and other remedial actions completed since the year 2000.

| Table 4-64. A-4 Gypsum Pond Remediation Completed Since the Year 2000 |
|---|
| Installed a French drain along the toe of the north dike to intercept potential seeps and supplement the lowering of groundwater levels beneath the impounded gypsum. The drain extends ~ 650 toward the east from MGC on the north side of the north embankment. The drain is 3 ft wide and up to 12 ft deep. Drain rock was placed in the trench but was first lined with 8 oz geotextile material. |
| Constructed a lined drainage channel and outfall works around the closure area near the eastern perimeter to convey drainage from Deadwood Gulch to Bunker Creek. The channel is stabilized by concrete, riprap, and vegetation. |
| Completed construction of a primary drainage channel and associated outfall works at the extreme west side of the A-4 closure area to convey perennial and seasonal flows of up to 450 cfs that originate from the upper reaches of Magnet Gulch. Drainage is collected in a large, rock gabion structure that extends the length of Magnet Gulch channel within the A-4 facility. The gabions were placed on a grade that ranges from 15 – 50 percent after up to 40 feet of gypsum material was excavated from the area. The base of the channel is at a shallow grade of <5 percent. |
| Infilled existing solution cavities, plugged and partially removed the former decant piping and regraded the impounded gypsum to produce a closure subgrade that slopes from a central ridge toward the northwest and northeast corners on the impoundment at a gradient of not less than 2 percent, thereby promoting positive surface drainage from the closure area to engineered discharge points. |
| Constructed runoff control ditches near the downgradient perimeter of the closure area to intercept and divert localized drainage to either Magnet Gulch or Deadwood Gulch channels. |
| In 2002, soil was applied to the west end of the A-4 in association with the completion of the Magnet Gulch channel. In 2003, the SMC applied cover soil over 75 percent of the A-4, to replace re-contaminated cover-soil. |
| Vegetation was established onsite following soil placement in 1996. The species mixture used was comprised primarily of pasture-type grasses. The goal at that time was to influence water infiltration into the soil cap by increasing evapotranspiration. The species selected were aggressive in their growth and quickly achieved the 85 percent RDR cover requirement; however, the vegetation in much of the area was eliminated when the cover soil was replaced again in 2003. The species seed mixture was then reassessed and new species were introduced into the seed mixture to provide more native type plants that would require less O&M and would be longer lasting. Final seeding will be completed in 2005. Final vegetative performance will be a function of O&M. |

### 4.3.12.4 Operations and Maintenance

An O&M Plan for the A-4 Gypsum Pond was approved by the IDEQ in 2004 (MFG, 2004). This plan specifies the requirements for scheduled and unscheduled long-term O&M activities at the A-4 Gypsum Pond. The plan's goal is to minimize impacts to human health and the environment while also maintaining focus on ROD requirements and performance standards. It requires SMC to monitor all aspects of the A-4 Gypsum Pond remediation activities each year after the spring melt and before snowfall. The plan also calls for inspections to be made following significant storm events that may contribute to a compromise of the protective soil cap over the A-4 Gypsum Pond.

The extensive review requirements and performance standards are detailed in the O&M plan. The following provides a general overview of the plan's requirements:

1. Inspection of the areas underlain by gypsum for settlement and subsidence. This includes periodic seismic assessment along with visual analyses;
2. Maintenance of drainage channels -
   a. To convey 100-year, 24-hour events
   b. Concrete and gabion structures
   c. Spillways and energy dissipation channels free of vegetation;
3. Replacement of riprap in key drainages and McKinley Pond;
4. Maintenance of vegetative cover, including noxious weed control;
5. Maintenance of soil cover, especially following heavy storm events and season runoff;
6. Maintenance of site perimeter fence, signs and gates to control public access to the site;
7. Maintenance of culverts, to include evaluation of leakage at the headwall and blockages; and
8. Maintenance of site roads, to include reduction of rills and gullies.

#### 4.3.12.5 Technical Assessment of A-4 Gypsum Pond Remedial Actions

Per USEPA guidance (USEPA, 2001b), technical assessment was conducted by evaluating the following three questions related to protectiveness of the implemented remedial actions:

***Question A. Is the remedy functioning as intended by the decision documents?***

All A-4 Gypsum Pond remedial activities were completed in 2003. A final inspection was performed in 2004, and the IDEQ and the USEPA are currently in the process of certifying the completion of the A-4 Gypsum Pond closure remedy (MFG, 2005).

The remedy is functioning as intended by the 1992 OU2 ROD, the 1994 CD Statement of Work (SOW), and the RDR and RAWP. All remedial actions were designed and implemented to meet remedy requirements and objectives. Specific remedial actions completed are described in tables 4-63 and 4-64.

As summarized in Section 4.3.12.1, the primary remedial objectives of the A-4 Gypsum Pond closure remedy were to:

- Limit the possibility of contaminant mobilization to surface and groundwater;
- Provide a low maintenance barrier against direct contact with the impounded gypsum; and
- Reduce the potential for wind-blown dust from the facility.

Performance standards to achieve these objectives were :

- Regrading of the closure surface adjacent to the Magnet Gulch channel shall be graded such that the final slope is not less than 2 percent nor greater than 5 percent;

- The aggregate thickness of the closure cover system shall be not less than 12 inches, including a minimum of 6 inches of approved growth medium or topsoil and vegetation overlying a minimum of 6 inches of grading fill;
- The channels and appurtenant works for the Magnet Gulch and Deadwood Gulch drainage shall be sized to convey the storm flows resulting from the 100-year, 24-hour storm event;
- Analyses of representative samples of "clean soil" (growth media or topsoil) used in the construction of the vegetative cover system for the closure shall show mean contaminated concentrations not greater than 100 mg/kg of lead, 100 mg/kg arsenic, and 5 mg/kg cadmium. No single sample shall have an indicated lead concentration in excess of 150 mg/kg; and,
- Vegetation establishment within the A-4 closure area shall achieve coverage of 85 percent within 3 years after planting.

As noted in the IDEQ Pre-Certification Construction Completion Inspection Report (IDEQ, 2004), all of the above performance standards have been met to date with the exception of the vegetation standard. As mentioned in Table 4-64, prior to 2003 this standard had been met. But with reapplication of cover soil in 2003, the last seeding of grasses took place in the fall of 2003. The SMC is required to spray herbicides to control noxious weeds in the summer of 2005. Following spraying, the SMC will seed the shrubs and forbs during the fall of 2005; therefore, final evaluation of the success of this condition will not be done until 2008 or 2009. Attainment of this performance standard is being moved to the O&M phase and the SMC's operation and maintenance activities will ensure that the remedy remains intact and is protective of human health and the environment.

#### *Question B. Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?*

These are all still valid. Section 4.1.1 summarizes the ARARs review for the applicable OU2 decision documents. None of the new or revised standards identified in Section 4.1.1 call into question the protectiveness of the A-4 Gypsum Pond remedy.

#### *Question C. Has any other information come to light that could call into question the protectiveness of the remedy?*

There is no new information that calls into question the protectiveness of the remedy.

### *Remedy Issues*

**Table 4-65. Summary of A-4 Pond Remedy Issues**

| Remedy Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| None | -- | -- |

### *Recommendations*

**Table 4-66. Summary of A-4 Pond Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Vegetative Standard:** Review performance of vegetative standard at the next five-year review. It is currently estimated that this standard will be met in 2008 or 2009. | SMC | IDEQ, USEPA | 9/2010 | N | Y |

## 4.3.13 South Fork Coeur d'Alene River Removal and Stabilization Project

### 4.3.13.1 Review of ROD, ESD & ROD Requirements

While not specifically mentioned in the 1992 OU2 ROD, work on this reach of the SFCDR is an extension of the Smelterville Flats remedial action. This work included removal of highly contaminated tailings and tailings/alluvium mixtures, channel reconstruction, and re-vegetation to control migration of contaminants to surface water and groundwater. The 1992 OU2 ROD requirements and cleanup goals and objectives for this work are the same as those cited in Section 4.3.3 for the Smelterville Flats.

### 4.3.13.2 Background and Remedial Actions Up to Year 2000

Field investigations of the portion of the river between Theatre Bridge in Smelterville and Bunker Avenue Bridge in Kellogg found tailings and mixtures of jig tailings and alluvium in the bed and banks that were being eroded during high water events. Samples of these deposits indicated that while most contained between 2,000 and 6,000 mg/kg lead, some contained between 10,000 and 20,000 mg/kg lead. The remediation actions in the SFCDR before 2000 are presented in Table 4-67.

| **Table 4-67. SFCDR Remediation Prior to Year 2000** |
|---|
| In 1999, 3,850 linear feet of north bank between Theatre Bridge and the east end of the Kellogg Gun Range property was stabilized. The bank was initially graded to reduce the slope and remove previously-placed debris. Removed materials were transported to the CIA for disposal. Armoring consisted of a riprap blanket on a geotextile filter cloth placed in direct contact with re-graded embankment material. Modeling results indicated that during a 100-year event, velocities impacting the channel would vary depending on the channel width. Accordingly, riprap sizes varied from 18 to 24 inches and blanket thicknesses ranged from 24 to 36 inches. |

### 4.3.13.3 Actions Since Last Five-Year Review

In 1999, 2000, and 2001, contaminated floodplain sediments were excavated and hauled for disposal (mostly at the BAL). Removals focused on the eight areas with the highest heavy metal concentrations. A total of 88,970 cubic yards of material was taken from excavations ranging in depth from 4 to 11 feet. To avoid working directly in the river, the river was temporarily diverted into alternate channels.

In fall 2002, the eastern half of the reach was reconstructed. A buried rock sill was placed in the west bank just north of I-90 (near the Bunker Avenue bridge) to encourage the river to remain in that location. On the outside of the first bend downstream of I-90, the bank was armored with root wads. On the second bend downstream from the interchange and adjacent to I-90, the bank was armored with riprap. Topsoil was imported and placed on the floodplain inside of the first bend. Tree and shrub seedlings and grass seed were planted in this area by volunteers from local schools. In spring 2003, 2,500 containerized willows and 2,750 willow cuttings were planted along both banks by Northwest Revegetation and Ecological Restoration.

In fall 2003, the western half of the reach was reconstructed. The outside of one major bend was armored with root wads while the outside of another was armored with riprap. In spring 2004, willow cuttings were planted along portions of both banks and in a wetland. Barren upland areas were seeded.

#### 4.3.13.4 Assessment of SFCDR Removal and Stabilization Project Remedial Actions

Per USEPA guidance (USEPA, 2001b), technical assessment was conducted by evaluating the following three questions related to protectiveness of the implemented remedial actions:

***Question A. Are the remedies functioning as intended by the decision documents?***

The remedy is performing as designed.

***Question B. Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

Yes. Section 4.1.1 summarizes the ARARs review for the applicable OU2 decision documents. None of the new or revised standards identified in Section 4.1.1 call into question the protectiveness of the SFCDR Removal and Stabilization Project remedy.

***Question C. Has any other information come to light that could call into question the protectiveness of the remedy?***

There is no new information that calls into question the protectiveness of the remedy.

An evaluation of surface water and groundwater quality data is being conducted within OU2 to determine the effectiveness of the Phase I remedy. Phase II will consider any shortcomings encountered in implementing Phase I and will specifically address long-term water quality, and environmental management issues.

***Remedy Issues***

**Table 4-68. Summary of SFCDR Removal and Stabilization Project Remedy Issues**

| Remedy Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| None | -- | -- |

### *Recommendations*

| Table 4-69. Summary of SFCDR Removal and Stabilization Project Recommendations and Follow-Up Actions | | | | | |
|---|---|---|---|---|---|
| | | | | Follow-up Actions: Affects Protectiveness (Y/N) | |
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Current (now to 1 year) | Future (>1 year) |
| **Observational Monitoring:** Continue informal observational monitoring of SFCDA River removal and stabilization project sites, especially after flood events. Will also include as part of Smelterville Flats Phase 1 Remedial Effectiveness Monitoring. | IDEQ | USEPA | Ongoing | N | Y |

## 4.3.14 Miscellaneous Box Projects

### 4.3.14.1 Review of ROD, ESD & ROD Requirements

A number of miscellaneous Box projects have been conducted and funded by PRPS, the USEPA, and the State of Idaho over the past 7 years. While these individual projects are not specifically mentioned in any decision document, these smaller-scale projects are extensions and/or compilations of other larger remedial actions at the Site, e.g., Smelterville Flats. As such, these projects were designed and implemented to meet the remedial action objectives of the larger remedial actions.

### 4.3.14.2 Background and Remedial Actions Since Last Five Year Review

Projects were selected based on a number of evaluation criteria including: concentration of lead (greater than 1,000 mg/kg); accessibility by public; potential for migration or recontamination; condition of adjacent properties; and how remediation of each area fit into the overall remedy for the Box.

Once selected, project remedies were based on applicable RDRs for that area. For example, the RDRs for the OU1 residential remediation program were used for residential, commercial, and ROW properties adjacent to UMG-remediated properties (MFG, 1994). In addition, for all of these projects, current and future land uses and consistency with the ICP were considered in deciding specific actions for each property.

Table 4-70 below lists the miscellaneous projects conducted in the Box since 1998. It also includes the ROD and ESD sections applicable to each project.

| Table 4-70 Miscellaneous Box Projects Since 1998 | | |
|---|---|---|
| Project | Description | ROD Document |
| City of Smelterville Fencing | 1998. Fenced off the un-remediated portion of Smelterville that was outside the UMG's responsibility. The purpose of the project was to control access for children who might want to play in the unremediated area. | 1992 OU2 ROD Section 9.2.9 |

**Table 4-70 Miscellaneous Box Projects Since 1998**

| Project | Description | ROD Document |
|---|---|---|
| Remediation of Airport Road Shoulders | 1999. Remediated shoulders of airport road in the Smelterville Flats area by removal and replacement with 6 inches of clean gravel | 1992 OU2 ROD Section 9.2.6 |
| Fencing of ICP Repository | 1999. Provided access controls to the contaminated soil repository at Page Ponds | 1991 OU1 ROD |
| Smelterville Flats Access Control | 2000. Fenced off remediated portions of Smelterville Flats to protect remediated area from unauthorized vehicular traffic. | 1992 OU2 ROD Section 9.2.2 |
| Smelterville 7th Street Paving | 2000. Capped an unremediated road in the city of Smelterville with asphalt. This road serves platted lots in Government Gulch. | 1992 OU2 ROD Section 9.2.6 |
| Hangaard Arena Water Supply | 2000. Provided clean water supply to users of the Hangaard Arena recreation area. Water is also used to wet down soil to reduce airborne contaminant migration | 1992 OU2 ROD Section 9.2.11 |
| Lower Government Gulch | 2001/2002. This project can be divided into two actions. The first action was completed in late 2000, and included realigning and increasing hydraulic capacity of Government Creek to handle a 100-year flood event (see Section 4.3.2.3). The second action was completed during the 2001 construction season. Vacant or unused areas in lower Government Gulch were capped with 6-inches of gravel. These areas included the area just south and west of the McKinley Avenue intersection with Government Gulch up to the Silver Valley Lab (SVL) and east of the hillside, the area between the Enyeart Lumber Yard and Bunker Creek, and the area between the Enyeart Lumber Yard and the I-90 interchange in Smelterville. The Enyeart Lumber Yard was capped with asphalt of varying thickness based on the use of heavy equipment to move around lumber. A storm drain system was installed under the asphalt, and the surface was graded to drain toward inlets. Recommendations for maintenance and protection of drainage system and cap were formally provided to the owner. | 1992 OU2 ROD Sections 9.2.1 and 9.2.7 |
| Post Remediation Road Repair in Smelterville | 2001. Capped over damaged road areas in the city of Smelterville to protect against contaminant migration from potholes and associated vehicular tracking. | 1992 OU2 ROD Section 9.2.6 |
| North Idaho Recycle Yard | 2001. This project was completed during the 2001 construction season, and can be considered an extension of the Smelterville Flats remedial action (see Section 4.3.3). The property is located South of I-90 and west of Smelterville. The cap design took into account the typical activities of the property. A concrete paved area for the recycled material drop-off pile and asphalt cap for moving and transporting the material into the building was established. The remainder of the property received a 12-inch-thick gravel cap. The remedial action included surface water drainage through grading and a storm drain system. Recommendations for maintenance and protection of the drainage system and cap were formally provided to the owner. | 1992 OU2 ROD Sections 9.2.2 and 9.2.7<br>OU2 ESD 4-98 |
| S&P Truck Stop | 2001. This project was completed during the 2001 construction season, and is also considered an extension of the Smelterville Flats remedial action. The site is located on the north side of I-90 just east of the Smelterville, I-90 interchange. The first capping of this truck stop was completed by the PRP (see Section 4.3.3); however, when the waste rock used for the cap was found to be contaminated, the | 1992 OU2 ROD Sections 9.2.2 and 9.2.7<br>OU2 ESD 4-98 |

**Table 4-70 Miscellaneous Box Projects Since 1998**

| Project | Description | ROD Document |
|---|---|---|
| | USACE re-capped the site. The cap design took into account typical activities at the site including truck parking and use of the gas station. Additional complexity of the site was an existing treatment/monitoring system installed to address fuel contamination beneath the gas station. Based on heavy truck traffic, the area immediately around the gas station and building was paved. The lot behind the gas station and between the road and the river were capped with a minimum of 6-inches of gravel suitable to support routine truck parking. The remedial action included surface water drainage through grading and a storm drain system. Recommendations for maintenance and protection of the drainage system and cap were formally provided to the owner. | |
| Airport Area Remediation Phase I – Residential Area | 2001. Remediated residential property at the Shoshone County Airport according to the residential area Remedial Design Report for residential properties. | 1991 OU1 ROD |
| Airport Area Remediation Phase II - Airport Area | 2001. Remediated contaminated areas of the parking lot and around the hangars and runway according to the residential area Remedial Design Report for rights-of-way and commercial properties. | 1992 OU2 ROD Section 9.2.7 |
| Upper Industrial Landfill Removal | 2001. Removed the remaining portion of the upper industrial landfill out of the Railroad Gulch drainage. Material was consolidated in the Borrow Area Landfill. | 1992 OU2 ROD Section 9.2.5 |
| Residential Area Cleanup '01 *and* '02 | 2001. Remediated residential areas that were not in the UMG's area of *responsibility or were not completed by the UMG in construction year* 2001. Work included removal of contaminated material and replacement according to Remedial Design Reports. | 1991 OU1 ROD |
| Kellogg Storm Sewer Pipe | 2001. In a joint project with the City of Kellogg, IDEQ purchased pipe for the storm drain project near the Kellogg City Park and Greenbelt. This area has been prone to flooding with the resulting contamination. The new sewer pipe has prevented the continuing recontamination of the remediated soil in this area. | 1992 OU2 ROD Section 9.2.6 |
| Pine Creek bed removal and disposal | 2001. Removal of contaminated bed load from Pine Creek in Pinehurst. The purpose was to remove contaminants and help reduce potential for flooding which would recontaminate remediated areas in Pinehurst. | 1991 OU1 ROD to prevent recontamination (also could be considered under OU3 12.2) |
| Moved Avista power pole to support remediation near A4 Gypsum Pond | 2001. Moved power pole to allow access to remediation of Smelter Complex areas adjacent to the A-4 Gypsum pond. | 1992 OU2 ROD Section 9.2.5 |
| West Gate Contractor Staging Area | 2001/2002. This project was completed over the winter of 2001/2002, and can be considered an extension of both the Government Gulch and Smelterville Flats remedial actions. This area is located east of Government Gulch Road, north of the UPRR Trail, west of the CIA and south of I-90, and was used as a staging area for contractors. The remedial action consisted of grading and placing a 6-inch gravel cap on the old "MK Town, " and also established a trailer court area for continued use by contractors conducting remedial action oversight at the site. | 1992 OU2 ROD Sections 9.2.1 and 9.2.2 |

**Table 4-70 Miscellaneous Box Projects Since 1998**

| Project | Description | ROD Document |
|---|---|---|
| McKinley Avenue Capping | 2002. With the objective to open McKinley Avenue to the public, a substantial amount of miscellaneous capping along McKinley was conducted. Areas remediated were generally capped with 6-inches of gravel. These areas included the mouth of Deadwood Gulch, the parking lot west of the A-4 gypsum pond, the snow storage area east of the A-4 area lined pond, McKinley ROW shoulders, the south west side of the old Slag Pile Area (SPA) and the east security gate. Additionally, the direct feed mine water line project (see Section 4.3.8.3) included capping in the area of the CTP, and along the slopes from McKinley north to the UPRR trail. | 1992 OU2 ROD Section 9.2.6<br>OU2 ESD 4-98 |
| Topsoil from Hayden Jail Facility | 2002. Obtained 5,000 cy of clean topsoil for remediation at the Bunker Hill Superfund Site | 1992 OU2 ROD Section 9.2.2 |
| UPRR ROW Capping | 2002-2003. Six- and twelve-inch gravel caps to cover exposed sections of tailings or ballast were placed intermittently along the UPRR ROW in the Box (see Section 4.3.10). Many of these areas were "orphan" areas that were small slivers of ground outside the UPRR ROW, and adjacent to previously capped properties. This work was completed from where the trail crosses under I-90 at the Pinehurst Narrows, up to the east fence of the government property near the CTP. | 1992 OU2 ROD Section 9.2.6 |
| Pinehurst Golf Course Parking Lot | 2003. Remediated the unpaved portion of the golf course parking lot in Pinehurst consistent with site Remedial Design Reports. | 1992 OU2 ROD Section 9.2.7 |
| Slip lining Sloughline | 2003. Repaired sloughline to eliminate flooding and recontamination near the UPRR ROW. This is a high water volume line with significant pressure. The line was an old stave pipe that was on the verge of failure. Failure would result in erosion and destruction of remediation barriers. | 1992 OU2 ROD Section 9.2.6 |
| City/Gun Range Road | 2004. The City/Gun Range Road east of the S&P Truck Stop was capped with 12-inches of gravel. Gravel was placed from the private boundary on the west side (White's RV Park) up to the easternmost termination of the Gun Range Road. | 1992 OU2 ROD Sections 9.2.2 and 9.2.6 |
| Kellogg Project Office Area (Slope Stabilization) | 2004. The contaminated areas around the Site's Kellogg Project Office were remediated, including the Insulspan property to the west of the project office. Remediation consisted of capping flat areas with 12-inches of gravel, and placement of eco block at the toe of the hill south of the Project Office and west across the Insulspan property. Slope stabilization: Eco blocks were placed to stabilize the hillside, and lessen chances of recontamination from future hillside sloughing. | 1992 OU2 ROD Section 9.2.7 |
| Avista Substation | 2004. This area is located just east of the Kellogg Project Office. In 2004, 12-inches of gravel were placed on the flatter sections with a small benched area being re-vegetated. | 1992 OU2 ROD Section 9.2.7 |

**Table 4-70 Miscellaneous Box Projects Since 1998**

| Project | Description | ROD Document |
|---|---|---|
| East Smelterville Private Properties (Slope Stabilization) | 2004. In 2004, one residential and five commercial properties were remediated in East Smelterville. These properties had been previously remediated; however, they were recontaminated due to subsequent sloughing of contaminated soil from the hillside above the residential property (see Section 3.2.1.1.4), and from contamination from the haul road adjacent to the commercial properties. Remediation consisted of excavation and placement of a 6-inch cap (sod or gravel depending on locale). Slope Stabilization: To prevent further contamination from hillside sloughing, eco blocks were placed along the east and south side of the 1 residential property at the toe of the hillside. | 1991 OU1 ROD |
| Box Boundary Properties | 2004. Eleven Pinehurst residential properties and ROWs adjacent to the UMG-responsible properties were excavated and/or capped within OU1. These are referred to as "Box Boundary" properties. The remedial actions for these properties were consistent with UMG's RDR. | 1991 OU1 ROD |
| Assay Office/McKinley ROW | 2004/2005. The Assay Office and McKinley ROW are north of the Kellogg Project. A 6-inch gravel cap was placed in these areas. | 1992 OU2 ROD Section 9.2.7 |
| Kellogg Alleys | 2005. Initiation of pilot study. Alleys in Kellogg are asphalted but at a thickness of only about 2 inches. This thickness does not create a durable barrier, particularly with heavy truck use associated with the remediation work and activities like garbage pick-up. This project will test various barriers in alleys using asphalt and compacted gravel. The project has selected alleys in poor condition for the pilot remediation test. | 1992 OU2 ROD Section 9.2.6 |
| Strip along Trail of the Coeur d'Alenes, East of Ross Ranch | 2005. Prescription was to remove some overgrown vegetation and placement of 6 inches of gravel cap. | 1992 OU2 ROD Section 9.2.6 |
| Upper Water Tank Road | 2005. Property adjacent to UMG remediated property around Wardner water tank. Placement of 12-inch cap. | 1991 OU1 ROD |
| Downs Street | 2005. Dirt road in Wardner which serves one house. Placement of 12-inch cap. | 1991 OU1 ROD |
| East of Smelterville Ponds | 2005. Four discrete areas east of Smelterville Ponds (South of I-90). Placement of 6-inch gravel cap. | 1992 OU2 ROD Section 9.2.2 |
| UPRR ROW Haul Road Shoulder | 2005. Haul road shoulder south of I-90 and south of the current TCI building along the UPRR ROW. Removal of debris and placement in Page Pond repository. Placement of a 6-inch gravel cap. | 1992 OU2 ROD Section 9.2.6 |
| UPRR ROW Bare Patches | 2005 or early 2006. Placement of 6-inches of gravel on bare patches along the UPRR ROW between the meandering trail and the fence. | 1992 OU2 ROD Section 9.2.6 |

### 4.3.14.3 Technical Assessment of Miscellaneous Box Capping Projects

Per USEPA guidance (USEPA, 2001b), technical assessment was conducted by evaluating the following three questions related to protectiveness of the implemented remedial actions:

***Question A. Are the remedies functioning as intended by the decision documents?***

The remedies implemented in the above miscellaneous Box projects are functioning as intended. As the various areas in OU2 are moved into the O&M phase, the State's O&M and ICP programs will ensure that these individual projects remain protective of the Box Phase I remedies.

***Question B. Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

Sections 3.1.1 and 4.1.1 summarize the ARARs review for the applicable OU1 and OU2 decision documents. None of the new or revised standards identified in Section 4.1.1 call into question the protectiveness of the remedies discussed above. Risk parameters identified in the RODs remain valid, and there are no new contaminants of concern. Current and future land uses are taken into account when implementing these remedies. During the next five-year review period, as the remaining OU1 and OU2 remedial actions and miscellaneous capping projects are completed, these projects will be inspected and assessed again to ensure protectiveness of the OU1 and OU2 remedies.

***Question C. Has any other information come to light that could call into question the protectiveness of the remedy?***

There has been no new information that would impact the protectiveness of the remedy.

### Remedy Issues

**Table 4-71. Summary of Miscellaneous Box Project Remedy Issues**

| Remedy Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| None | -- | – |

### Recommendations

**Table 4-72. Summary of Miscellaneous Box Capping Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| None | -- | – | -- | -- | – |

# 4.4 Monitoring

The 1992 OU2 ROD Section 9.2.15 requires monitoring to evaluate compliance with ARARs in surface and groundwater, biomonitoring to assess the status of ecological receptors and to evaluate the performance of the remedial actions. The primary goal of the water quality assessment monitoring is to determine the effect that remedial actions have had on water quality in OU2 and to inform future remedial action decisions. The air monitoring program was conducted from 2000 to 2003 to monitor fugitive dust; given that no exceedances were reported, the USEPA and the IDEQ decided that air quality monitoring could be discontinued unless additional source removal and hauling actions occurred. The biological monitoring program is being implemented to assess the status of the environmental receptors in OU2.

The USEPA and the IDEQ are currently developing a revised environmental monitoring plan for OU2 that will build upon the existing data for OU2 and the OU3 Basin Environmental Monitoring Plan or BEMP (USEPA, 2004). In addition, OU2 Phase I remedial-action-specific monitoring plans are in place for the hillsides area and the Smelter Closure Area. Other Phase I remedial-action-specific monitoring plans are under development. The revised OU2 environmental monitoring plan and Phase I remedial action effectiveness monitoring plans are expected to be implemented in 2006.

### 4.4.1 OU2 Water Quality Monitoring

The 1992 OU2 ROD requires periodic monitoring of water quality within OU2 to provide information about the changing nature and extent of contamination. The objectives for the water quality monitoring network are:

- Evaluate tributaries to the SFCDR within OU2 for compliance with AWQC;
- Evaluate groundwater within OU2 for compliance with MCL/MCLGs;
- Evaluate potential impacts on SFCDR water quality as a result of contributions from OU2 tributaries and groundwater; and
- Evaluate the effectiveness of the overall OU2 remedy and specific remedial actions within OU2 with respect to groundwater, surface water, and ecological conditions.

The original water quality monitoring network for OU2 was designed and implemented by the PRPs for OU2 in 1987 during the remedial investigation (MFG, 1992b). As a result of the bankruptcy of the major PRPs for the site in 1994 and subsequent Phase I remedy implementation by the USEPA and the State of Idaho from 1996 to 2000, several of the monitoring locations established during the RI were destroyed.

The current OU2 groundwater monitoring network within OU2 (Figure 4-12) consists of 78 monitoring wells. Of these wells, 30 monitoring wells were part of the RI water quality monitoring network established by the PRPs. Over time, the USEPA has worked to enhance the groundwater monitoring network within OU2 to evaluate groundwater with respect to the 1992 ROD objectives listed above. Enhancements to the groundwater monitoring network included:

- Five monitoring wells installed in 1996 to monitor the Smelter Closure Area;
- Twenty monitoring wells installed in 2000 as replacement wells for RI monitoring wells destroyed during remedial action implementations; and
- Twenty-three monitoring wells installed in a series of nested pairs (both upper and lower aquifers) along transects across OU2 in 2002 (CH2M HILL, 2003b).


## Legend

- Active Groundwater Wells
- Transects
- Water Features

N

0 2,500 5,000 Feet

FIGURE 4-12

**OU2 GROUNDWATER MONITORING NETWORK**
**BUNKER HILL SUPERFUND SITE**

FIVE-YEAR REVIEW

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In general, groundwater monitoring within OU2 occurred on a sporadic basis from 1987 to 1994 when the PRPs were responsible for the program. The groundwater monitoring program was re-started in 1996 by the USEPA and has been generally monitored on a quarterly basis to present. Groundwater monitoring wells installed to monitor the Smelter Closure Area were monitored on a monthly basis from 1996 to 2002 and quarterly thereafter.

The current OU2 surface water monitoring network is shown in Figure 4-13. The current surface water monitoring network consists of 3 monitoring locations on the SFCDR co-monitored as part of the BEMP developed for OU3 and 16 monitoring locations located at the mouths of tributaries throughout OU2, currently monitored on a quarterly basis.

The USEPA and the State of Idaho are developing a revised environmental monitoring plan for the overall OU2 remedy and remedial-action-specific effectiveness monitoring plans for six specific Phase I actions:

- Smelter Closure Area,
- Central Impoundment Area,
- Government Gulch,
- Bunker Creek,
- Smelterville Flats, and
- Page Ponds.

A PRP-led remedial-action-specific monitoring plan is already in place for the A-4 Gypsum Pond. It is anticipated that the OU2 Environmental Monitoring Plan for the overall remedy and remedial-action-specific monitoring plans for the six remedial actions will be completed and implemented in 2006.

#### 4.4.1.1 Technical Assessment of OU2 Water Quality Monitoring

Per USEPA guidance (USEPA, 2001b), technical assessment of the OU2 Water Quality Monitoring Program was conducted by evaluating the following three questions related to protectiveness of the implemented remedial actions:

***Question A. Are the remedies functioning as intended by the decision documents?***

The USEPA and the IDEQ are currently evaluating OU2 current water quality data and are in the process of revising the monitoring plans.

***Question B. Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

These assumptions are all still valid. Section 4.1.1 summarizes the ARARs review for the applicable OU2 decision documents. None of the new or revised standards in Section 4.1.1 call into question the OU2 water quality monitoring program.

***Question C. Has any other information come to light that could call into question the protectiveness of the remedy?***

Yes, but the primary goal in Phase I, as described in Sections 4.1 and 4.5, was not water quality improvement. However, water quality may have improved. The USEPA and the IDEQ are currently reviewing the OU2 surface water and groundwater quality data and to assess the effectiveness of the Phase I OU2 remedial actions.

## Remedy Issues

Table 4-73. Summary of Water Quality Monitoring Remedy Issues

| Remedy Issues | Affects Protectiveness (Y/N) Current (now to 1 year) | Affects Protectiveness (Y/N) Future (>1 year) |
|---|---|---|
| None | -- | -- |

### *Recommendations*

Table 4-74. Summary of Water Quality Monitoring Recommendations and Follow-Up Actions

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) Current (now to 1 year) | Follow-up Actions: Affects Protectiveness (Y/N) Future (>1 year) |
|---|---|---|---|---|---|
| **Environmental Monitoring Plan:** Complete revision of OU2 Environmental Monitoring Plan and implement | IDEQ, USEPA | USEPA | 3/2006 | N | Y |
| **Conceptual Site Model:** Complete revised OU2 Conceptual Site Model | IDEQ, USEPA | USEPA | 12/2006 | N | N |
| **Trend Analysis:** Complete statistical trend analysis of OU2 Phase I water quality monitoring data | IDEQ, USEPA | USEPA | 12/2006 | N | Y |
| **Phase I Assessment:** Complete assessment of OU2 Phase I remedial actions with respect to water quality | IDEQ, USEPA | USEPA | 7/2007 | N | Y |

## 4.4.2 Air Monitoring

An air-monitoring program was conducted within the OU2 site boundaries from 2000 to 2003. The 1992 OU2 ROD requires periodic monitoring of air at the Bunker Hill Superfund site to provide information about the changing nature and extent of contamination through the air exposure pathway. ROD-stated objectives of OU2 air monitoring are:

- To evaluate compliance with ARARs;
- To evaluate the performance of specific remedial actions and their respective O&M programs;
- To evaluate the adequacy of control measures instituted during the implementation of remedial actions; and
- To evaluate the success of remedial actions in protecting human health and the environment and determine the adequacy of remedial actions selected in the 1992 OU2 ROD.


## Legend

- Surface Water Monitoring Sites
- Water Features

N

0 2,500 5,000 Feet

FIGURE 4-13

**OU2 SURFACE WATER MONITORING NETWORK BUNKER HILL SUPERFUND SITE**

FIVE-YEAR REVIEW

File Path: Z:\USEnvironmentalProte\321104\GIS\MapDocuments\Mxds\5-Year Review\Figure 4-13.mxd

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As reported in the initial 2000 OU2 five-year review report, the air-monitoring program for OU2 was re-started in 1995 by the USACE to monitor fugitive dust that could potentially be generated by the ongoing government cleanup efforts. (Prior to 1995, air monitoring was conducted intermittently by the OU2 PRPs as part of their RI/FS process.) The USEPA and the State of Idaho provided oversight of the air-monitoring program.

The primary purpose of the air-monitoring program was to monitor fugitive dust that may be generated during the various site cleanups. For the safety of the general public, the applicable levels for comparison to measured data are the National Ambient Air Quality Standards (NAAQS) for particulate matter less than 10 microns ($PM_{10}$). Air monitors were installed at seven discrete locations around ongoing government cleanup efforts. These locations were:

- Bunker Avenue,
- East Gate,
- East Gate - collocated,
- Multi-plate overpass,
- Pinehurst,
- Smelterville Gate, and
- West Gate.

The completion of the CIA Closure in November of 2000 marked the end of major source removal actions within OU2 that would be expected to result in airborne dust. The USACE continued to monitor post-remediation air quality for a period of 2 years (November 2000 through the end of 2002). No total suspended particulate (TSP) exceedances of ambient air quality standards occurred during this 2-year time frame (Garry Struthers Associates, Inc. 2000; Spring Environmental, Inc. 2001; Herrera Environmental Consultants, Inc. 2002; Herrera Environmental Consultants, Inc. 2003). In consideration of these 2 years of air quality data with no exceedances, the USEPA and the State decided that air quality monitoring was no longer needed within OU2 unless additional source removal and hauling actions were to be conducted within the OU2 boundary.

#### 4.4.2.1 Technical Assessment of OU2 Air Monitoring

In accordance with USEPA guidance (USEPA, 2001b), technical assessment of the OU2 Air Monitoring Program was conducted by evaluating the following three questions related to protectiveness of the implemented remedial actions:

***Question A. Are the remedies functioning as intended by the decision documents?***

Air monitoring data gathered through 2002 indicates that the implemented remedies are performing as intended by the decision documents and have reduced air-borne total suspended particulates to below ambient air quality standards.

***Question B. Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

These assumptions are all still valid. Section 4.1.1. summarizes the ARARs review for the applicable OU2 decision documents. None of the new or revised standards in Section 4.1.1 call into question the OU2 air monitoring program.

### *Question C. Has any other information come to light that could call into question the protectiveness of the remedy?*

No new information has come to light that could call into question the protectiveness of the remedy.

### *Remedy Issues*

**Table 4-75. Summary of Air Monitoring Remedy Issues**

| Remedy Issues | Affects Protectiveness (Y/N) Current (now to 1 year) | Affects Protectiveness (Y/N) Future (>1 year) |
|---|---|---|
| None | -- | -- |

### *Recommendations*

**Table 4-76. Summary Air Monitoring Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) Current (now to 1 year) | Follow-up Actions: Affects Protectiveness (Y/N) Future (>1 year) |
|---|---|---|---|---|---|
| None | | | | -- | -- |

## 4.4.3 Biological Monitoring

### 4.4.3.1 Background and Objectives

In accordance with the OU2 ROD and the first five-year review recommendations for OU2 (USEPA, 2000a), a biological monitoring program is being implemented to assess the status of the environmental receptors in the non-populated areas of the Bunker Hill Box. Biological monitoring is a component of the OU2 monitoring plan and the U.S. Fish and Wildlife Service implemented the biological monitoring activities from 2001-2004 through an interagency agreement with the USEPA. The OU2 ROD did not select remedial actions for protection of ecological receptors; however, habitat establishment is a desired outcome of the remedy. As a habitat is established, biological monitoring activities are being conducted to evaluate impacts to resident populations. These monitoring activities are focused on remediated areas to evaluate the status of biological resources and their habitat in OU2, and thereby monitor the effectiveness of remedial actions related to those resources. The results of the biological monitoring activities in OU2 will support the development of similar activities in OU3. The scope of the OU2 biological monitoring program is summarized in Table 4-77 and discussed in detail below.

### 4.4.3.2 Results

The results of the OU2 biological monitoring program are described in detail in annual reports (USFWS, 2002, 2003, 2004) and a final report (USFWS, 2005). The summary discussion included in this document is organized as follows:

- Vegetation mapping,
- Wildlife population monitoring, and
- Wildlife exposure monitoring.

In addition, the biomonitoring focused on remediated areas and the findings are discussed elsewhere in this five-year review within the context of each remedial action area that has been the subject of biological monitoring. Figure 4-14 provides a map of the OU2 sampling areas.

**Table 4-77. OU2 Biological Monitoring Program Summary**

| Sampling Area | Studies Conducted | Sampling Period |
|---|---|---|
| Page Ponds and associated wetlands | Waterfowl surveys | April-August 2001/2003 |
| | Waterfowl blood collection (blood Pb) | July 2003 |
| | Wetland vegetation mapping | August 2002/2004 |
| Smelterville Flats | Amphibian and reptile surveys | Spring and summer 2001 |
| | Small mammal population surveys | July-September 2001 |
| | Small mammal collection (metal residues) | September 2001 |
| | Wildlife fecal collection (metal residues, AIA) | June-October 2001/2002/2003 |
| | Songbird blood collection (blood Pb, ALAD, soil) | July 2002/2004 |
| Government Gulch (defined gulch and hillside areas) | Small mammal population surveys | July-September 2001/2003 |
| | Small mammal collection (metal residues) | September 2001/2002/2003 |
| | Vegetation surveys | July-September 2001 |
| | Songbird blood collection[1] (blood Pb, ALAD, soil) | June 2003 |
| Magnet Gulch (defined gulch and hillside areas) | Small mammal population surveys | July-September 2001 |
| | Small mammal collection (metal residues) | September 2001/2003 |
| | Vegetation surveys | July-September 2001 |
| | Songbird blood collection[1] (blood Pb, ALAD, soil) | June 2003 |
| Deadwood Gulch (defined gulch and hillside areas) | Small mammal population surveys | July-September 2001 |
| | Small mammal collection (metal residues) | September 2001/2002/2003 |
| | Vegetation surveys | July-September 2001 |
| | Songbird blood collection[1] (blood Pb, ALAD, soil) | June 2003 |
| OU2-Wide | Breeding Bird Surveys | June 2001/2002/2003/2004 |
| | Wildlife fecal collection (metal residues, %AIA) | June-September 2001/2002/2003 |
| South Fork Coeur d'Alene River | Amphibian and reptile surveys | Spring and summer 2001 |
| | Fish population surveys | September 2003 |
| | Fish collection (metal residues) | September 2002 |
| | Riparian habitat surveys | September 2003 |
| | Aquatic invertebrate collection (metal residues) | September 2003/2004 |
| Rochat Divide / Latour Creek (reference) | Breeding Bird Surveys | June 2001/2002/2003/2004 |
| | Small mammal population surveys | July-September 2003 |
| | Small mammal collection (metal residues) | July-August 2002/2003 |
| | Vegetation surveys | July-August 2002/2003 |

| Table 4-77. OU2 Biological Monitoring Program Summary | | |
|---|---|---|
| **Sampling Area** | **Studies Conducted** | **Sampling Period** |
| Little North Fork Coeur d'Alene River (reference) | Songbird blood collection (blood Pb, ALAD, soil)<br>Wildlife fecal collection (metal residues, %AIA) | June-August 2002/2003<br>June-September 2001/2002/2003 |

[1] Songbird blood collection was conducted on hillside areas only.
%AIA - percent acid-insoluble ash which is an estimate of the sediment content animal feces
ALAD - delta-aminolevulinic acid dehydratase which is a blood enzyme and provides a well documented measure of bird health

## Vegetation Community Surveys/Wetland Vegetation Mapping

*Vegetation Surveys Associated with Breeding Bird Survey Routes*

Vegetation community surveys were conducted in 2003 at four observation points within OU2 and two observation points above OU2 along the Bunker Hill breeding bird survey (BBS) route. Surveys were also conducted at six observation points along a reference survey route, the Rochat Divide BBS route.

Relative to the Bunker Hill BBS route, the Rochat Divide BBS route had greater species diversity of both trees and shrubs, and the dominant ground cover was forbs rather than grass. Total numbers of trees and average tree heights were also greater on the Rochat Divide BBS route compared to the Bunker Hill BBS route. In addition, average litter depths observed on Rochat Divide were 1.7 inches deeper than those observed within OU2. These differences indicate that the current vegetation composition within OU2 continues to be deficient in tree canopy cover, species diversity, and litter layer depths as compared to the typical vegetation components of the surrounding area.

*Vegetation Surveys Associated with Small Mammal Population Study Areas*

The vegetative composition within each small mammal trapping grid and/or transect array on OU2 (Figure 4-14) and the Latour Creek reference area was assessed in 2002. Relative to OU2, the Latour Creek reference area had greater species diversity of both trees and shrubs, and the dominant ground cover was forbs rather than bare ground or grass. A total of eleven tree species and nine shrub species were documented on the Latour Creek reference area, while a total of seven tree species and five shrub species were documented on OU2. In addition, total numbers of trees and average tree heights were also greater on the Latour Creek reference area relative to Bunker Hill. For the Latour Creek reference area, western red cedar (*Thuja plicata*) was the dominant tree species. Dominant size class for trees was seedling/sapling, but average tree height was 39.6 feet. Mallow ninebark (*Physocarpus malvaceus*) was the dominant shrub species and forbs were the dominant percent ground cover. Average litter depths for all sites sampled at OU2 ranged from 0.4 to 0.8 inch, while average reference area litter depth was 2.5 inches.

These differences indicate that while the vegetative cover is improving from pre-ROD conditions, the current vegetation composition within OU2 continues to be deficient in tree canopy cover, species diversity, and litter layer depths relative to the typical vegetation components of the surrounding area. Of particular concern is the relative lack of ground cover observed in OU2. Bare ground has the potential of exposing wildlife populations to direct contact with contaminants of concern, which may be present in post-remediation soils. These results are comparable to the vegetation survey results documented on the OU2 and Rochat Divide BBS routes.

*Wetland Vegetation Mapping at Page Ponds*

Wetland vegetation was characterized in the Page Ponds associated wetlands (East and West Swamps; Figure 4-14) in September 2002 and 2004 to evaluate changes in the vegetation community structure and other habitat features via comparison to previous efforts (Audet et al. 1999). The dominant habitat types in both 2002 and 2004 in both wetlands were palustrine emergent and scrub-shrub. The 1997, 2002, and 2004 comparisons showed little change in the overall vegetative composition of the dominant habitat types or dominant plant species. The most significant changes appear to be the western end of West Swamp, which is increasing in both palustrine emergent and cattail cover types.

From a biological perspective, there are concerns regarding the continued use of the west bench area of the Page Ponds Wastewater Treatment Plant as a repository for residential yard soils. Expansion of the repository into the West Swamp would effectively reduce the overall wetland component. In accordance with objectives identified in the 1992 OU2 ROD (USEPA, 1992) and Executive Order 11990 (Protection of Wetlands), if this expansion were to occur, mitigative measures will be required to compensate for the loss of wetland habitat.

### *Wildlife Population Monitoring*

*Breeding Bird Surveys*

A breeding bird survey route was established at OU2 in June 2001. Twenty-nine observation points were established within OU2 and five observation points in areas above the site. Points established in uncontaminated areas above the site and the previously established Rochat Divide BBS reference route were used for assessment and comparison to the OU2 route.

Based on BBS data, substantial bird community differences exist between OU2 and reference areas. Species of birds with the highest densities observed within OU2 (2001-2003) represent more adaptable species with less stringent habitat requirements and are typically observed in open habitats such as grassland, meadows, canyons, and shrub habitat. By comparison, highest density bird species observed in reference areas typically forage on seeds and insects found in conifer and mixed conifer habitats, and require tree cavities for nesting and brooding (Ehrlich et al., 1988) similar to mature forested stands typical of areas dominated by forests in northern Idaho. Differences in bird species present suggest that vegetation supporting local bird communities has not recovered within OU2. Substantial regeneration of forested habitat and vegetative ground cover within OU2 may be needed to produce bird community characteristics that are comparable to adjacent habitats.

*Page Ponds and Associated Wetlands Waterfowl Surveys*

Waterfowl surveys in Page Ponds and associated swamps were conducted in the spring (March through May) and summer (June through August) of 2001 and 2003. Average waterfowl use ranged from 120.8 to 488.3 birds per survey. A high of 23 waterfowl species was observed during surveys. Mallards (*Anas platyrhynchos*), Barrow's goldeneye (*Bucephala islanica*), red-headed duck (*Aythya Americana*), and green-winged teal (*Anas crecca*) were the most frequently observed waterfowl. Comparisons of previous studies conducted at the site indicate fluctuations in population densities between years (Burch et al., 1996; Audet et al., 1999). It is likely that the continuing changes in water management and remedial activities at or near the Page facility may be impacting waterfowl use.

*Small Mammal Population Surveys*

Small mammal mark and recapture population surveys were conducted July and August 2001 and 2003. Sites sampled in 2001 consisted of the defined gulch and hillside areas of Government, Magnet, and Deadwood Gulches, and the Smelterville Flats area (Figure 4-14). Sites sampled in 2003 included the gulch and hillside areas of Government Gulch and the Latour Creek reference area. Data indicated that relative abundance within OU2 was greater in 2001 compared to Herman's 1975 study (UFSWS, 2001). However, species diversity at OU2 was substantially less than previous studies (Herman, 1975) and reference data. These differences can potentially be attributed to current habitat conditions (Hall, 1981; Foresman, 2001). Current conditions represent an early successional stage of forest development (USFWS, 2003), which tends to support the small mammal community structures currently observed onsite.

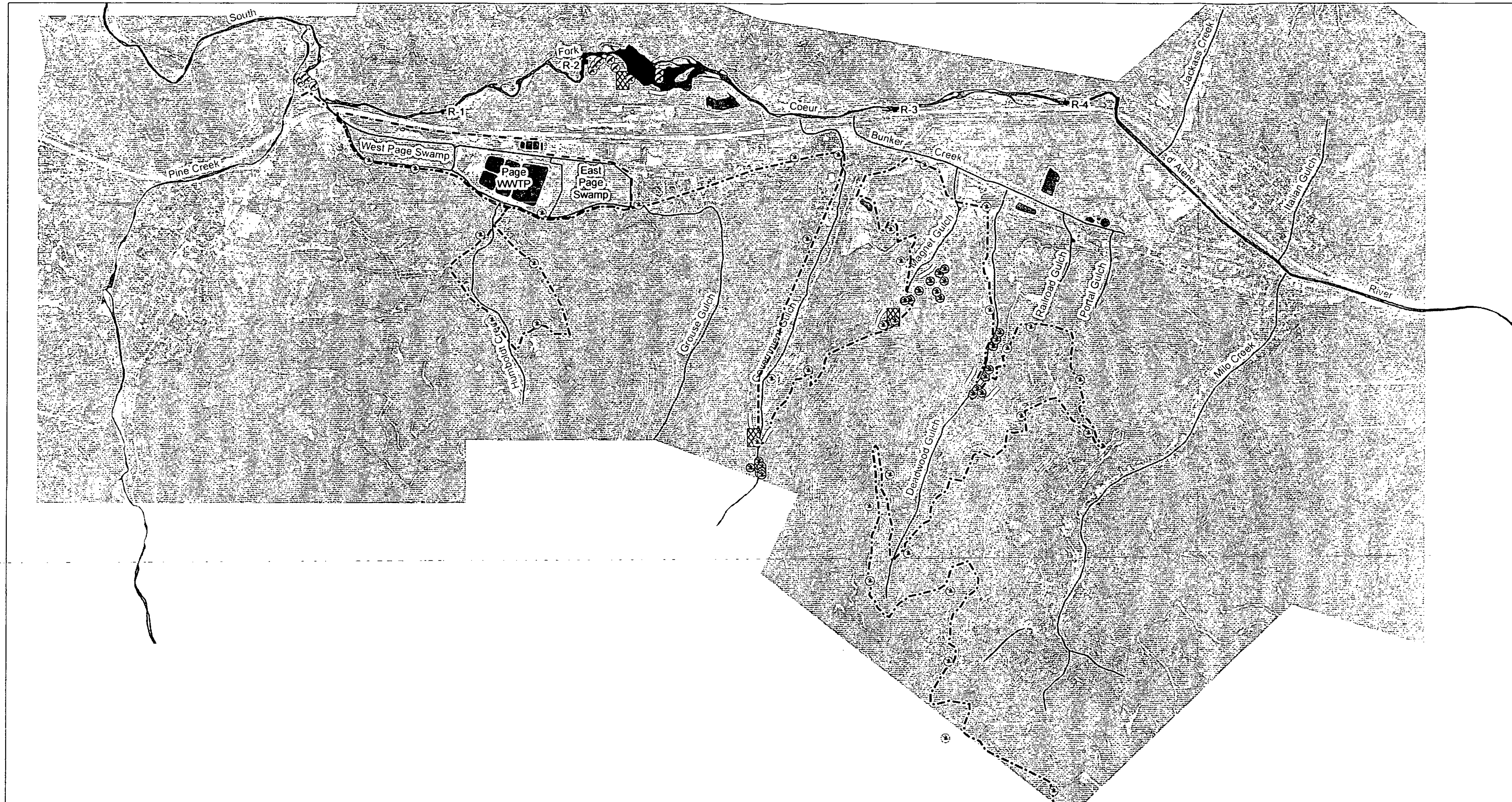
*Fish Population Surveys*

Fish population surveys were conducted September and October 2003 along four 100-meter sampling units in the SFCDR within OU2 (Figure 4-14). Comparisons of these data to previous surveys and the USFWS surveys to be conducted in 2005 will be reported to the USEPA in a subsequent report.

One-hundred twenty-four fish were captured from all sites during fish population monitoring: 77 brook trout (*Salvelinus fontinalis*), 9 cutthroat trout (*Salmo clarki*), 2 rainbow trout (*Oncorhynchus mykiss*), and 36 other individuals including perch (*Percidae spp.*), mountain whitefish (*Prosopium williamsoni*), and sucker spp. (*Catostomus spp*). Estimates of total fish populations in the SFCDR within OU2 ranged from 19 fish at SFR-2 to 65 fish at SFR-3. Estimates of fish populations per sampled area ranged from 0.013 fish per square meter ($m^2$) at SFR-2 to 0.041 fish/$m^2$ at SFR-3. Number of species captured ranged from 3 at SFR-2 to 6 at SFR-1.

*Stream Habitat Survey*

Average wetted channel width for the 4 sites on the SFCDR within OU2 was 14.3 meters. Estimated bank full widths ranged from 20.9 m at SFR-1 to 94.0 m at SFR-4. Water depth averaged 0.40 m. Runs and glides were the dominant component (60 to 80 percent), while pools were the least abundant habitat type. Cobble was the dominant substrate at all sampling locations. Average canopy cover was 2.5 percent and average bank cover was 12.5 percent. The riparian corridor for these sites was primarily comprised of bare ground and received a woody debris class of 1.




## Legend

- Mist Net Sites
- Old Mist Net Sites
- Bird Survey Points
- Grid Trap Sites
- Transect Trap Sites
- Fish Population Surveys
- Waterfowl Survey Areas
- Bird Survey Route
- Water Features

N

0 2,500 5,000 Feet

FIGURE 4-14

**USFWS BIOLOGICAL MONITORING SITES (2001-2004) BUNKER HILL SUPERFUND SITE**

FIVE-YEAR REVIEW

File Path: Z:\USEnvironmentalProte\321104\GIS\MapDocuments\Mxds\5-Year Review\Figure 4-14.mxd

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*Amphibian and Reptile Population Surveys*

Five amphibian and reptile population surveys were conducted in 2001 during the spring breeding season (April through May) and the post-breeding season (July) in OU2. Few amphibians and reptiles were observed during surveys; collections did not provide adequate sample numbers to pursue an evaluation of population abundance and diversity or metal exposure.

The current lack of adequate habitat conditions along the SFCDR corridor appears to limit amphibian populations. The continued re-engineering and sediment removal conducted in the SFCDR has also appeared to produce low quality amphibian and reptile habitat. The USFWS recommended that amphibian and reptile population surveys be suspended after the initial 2001 surveys.

### *Wildlife Exposure to Contaminants of Concern*

*Songbird Exposure and Health Evaluation-2003 Data*

Songbird ingesta, liver, and blood sampling was conducted within OU2 in June 2003 and in 2004 to determine routes of exposure and health of avian receptors in relation to lead concentrations in post-remediation soil. ALAD inhibition was examined in relation to lead body burdens in songbirds utilizing OU2 areas and a reference area to determine site-specific correlations (Blus et al., 1995), assessing the effectiveness of remediation in protecting avian insectivore receptors (delta-aminolevulinic acid dehydratase [ALAD] is a blood enzyme that provides a well documented measure of bird health). Study locations included the hillside areas of Government Gulch, Magnet Gulch, and Deadwood Gulch (Figure 4-14). Reference samples were collected along the Little North Fork of the Coeur d'Alene River (LNFCDR).

Mean soil lead concentrations differed significantly among locations sampled, with mean concentrations increasing from the reference area (24.6 mg/kg) to Government Gulch (171 mg/kg) to Magnet Gulch (1201 mg/kg).

Percent soil in ingesta of all songbirds was negatively correlated to mean soil lead concentration across sites. Songbirds in general do not appear to be consuming different amounts of soil at different sites. Pathway analysis showed songbird lead exposure to be from soil ingestion, corroborating correlated differences among location lead concentrations in soil and bird blood.

Songbirds examined within OU2 remediated areas carried blood lead levels above the reference location and high enough to be indicative of physiological impairment to wildlife. All blood lead samples greater than 0.2 mg/kg, corresponding to more than 50 percent ALAD inhibition, were collected from Magnet and Deadwood Gulches. Blood lead levels greater than 0.167 mg/kg were not observed in two of three songbird species sampled. Blood lead in this range may be indicative of acutely toxic levels to certain songbird species, precluding us from capturing and examining such individuals. An investigation into physiological effects of blood lead above levels we observed for these species would be required to determine acute thresholds. In contrast, we observed blood lead levels up to 1.13 mg/kg and corresponding ALAD inhibition up to 88.8 percent in American robins (*Turdus migratorius*). American robins as a species may be able to tolerate higher blood lead/ALAD inhibition than other songbird species sampled.

Lead-contaminated soil at Magnet Gulch appears to be eliciting the greatest negative effects in songbirds of the locations studied. Further examination and monitoring are required to evaluate whether post-remediation lead soil concentrations remain above levels toxic to songbirds and to determine trends in songbird lead body burdens.

*Waterfowl Blood Lead Evaluation*

Blood samples were collected from 37 mallards (*Anas platyrhynchos*) in the East Swamp of Page Ponds, July 2003. Mean blood lead did not differ between ages, sexes, or ages within sex. Mean blood lead concentrations in adult and juvenile males and adult females were in the range considered clinical poisoning for waterfowl (0.05-0.10 mg/kg; Pain 1996). Mean juvenile female blood lead (1.54 µg/g) was above the threshold considered severe clinical poisoning (Pain, 1996). Mean blood lead in all groups was more than three times higher than levels associated with 50 percent ALAD inhibition (Pain, 1996). Data indicate that waterfowl juveniles and adults using the Page Ponds area continue to have blood lead levels above those considered to be clinically toxic to waterfowl. Page Ponds are the likely source of lead exposure for females and broods.

Mean blood lead for all mallards from the 2003 sampling was similar to previous studies (Mullins and Burch, 1993; Burch et al., 1996; Audet et al., 1999). No downward trends are apparent in overall lead concentrations in mallards utilizing Page Ponds wetlands. Current sediment lead levels within Page Ponds appear to continue to be above toxic threshold levels to waterfowl.

*Small Mammal Whole-Body and Liver Metals Evaluation*

Small mammals were collected for metals residue analysis at the completion of population surveys, 2001-2003. Both whole-body and liver tissue metal concentrations were measured.

Cadmium, lead, and zinc in deer mice and voles collected from OU2 were significantly higher than reference area levels. Deer mouse mean concentrations were highest for arsenic at Deadwood Gulch, and highest for cadmium, lead, and zinc at Magnet Gulch. Vole concentrations were highest for cadmium, lead, and arsenic at Magnet Gulch; zinc concentrations were highest at Government Gulch. Shrew concentrations were highest for arsenic at Government Gulch; cadmium concentrations were highest at Smelterville Flats.

Liver metal concentrations were significantly higher in OU2 deer mice than those of reference areas. No significant differences in metal concentration levels were detected among OU2 areas. Ma (1996) reports that liver lead levels above 5 mg/kg dry weight (dw) can be taken as a chemical biomarker of toxic exposure to lead in mammals. Two deer mice collected form the Deadwood Gulch and Government Gulch assessment areas had liver lead values of 3.76 and 4.36 mg/kg dw, respectively. Relative to previous studies, current data (USFWS, 2003) indicates a decrease in exposure of small mammals to lead in OU2 over time. However, metal concentration levels in OU2 small mammals continue to be elevated above reference samples.

*Wildlife Fecal Metals Evaluation*

Wildlife receptors may ingest a substantial amount of soil during various activities, including feeding, grooming, and burrowing, exposing them to contaminants of concern. Opportunistic collection of wildlife feces was conducted 2001-2003 in order to evaluate the extent of soil ingestion and metal exposure in several wildlife species using OU2 post-remediation areas.

Percent acid-insoluble ash (%AIA) is an estimate of the sediment content of the feces. One hundred ninety-eight goose, elk, and deer fecal samples were collected and submitted for %AIA content analysis from 2001-2003. Combined-year soil ingestion rates did not differ among locations within species. Results indicate that geese, elk, and deer utilizing OU2 areas are not consuming more sediment than those using reference areas. Mean percent soil ingestion rates and standard errors were $12.99 \pm 1.12$ percent for goose, $1.12 \pm 0.29$ percent for elk, and $3.60 \pm 1.20$ percent for deer.

A total of 232 moose, coyote, Canada goose, deer, and elk fecal samples were collected for metal residue analysis from 2001-2003. Metal concentrations in all four species sampled from remediated areas appeared to be well above reference locations.

While the ecological receptors examined do not appear to be consuming more soil in OU2 remediated areas than reference areas, metal concentration in feces, and thus potential exposure to metals of concern, is elevated at remediated areas. Furthermore, concentrations for certain metals in Canada geese and deer feces appear to be increasing in OU2 areas. While increases were also observed for some metals at the Little North Fork reference area in deer, OU2 concentrations remain several times higher than those at the reference areas. Heavy metal exposure for receptors of interest within OU2 remediated areas is possibly increasing and remains a concern.

*Aquatic Invertebrate and Fish Metals Evaluation*

Aquatic invertebrates were collected in September 2003 and 2004 for metals residue analysis at fish population sampling locations. Twenty whole-body brook trout (*Salvelinus fontinalis*) and one sucker (*Catostomus spp.*) were collected in September 2002.

Metals tissue residues appear highest in reach 2. This may be due to its spatial relation to the Central Impoundment Area, directly upstream of reach 2 (Figure 4-14).

Mean concentrations of cadmium and lead in aquatic invertebrates were below negative effects levels. Tissue concentrations observed in brook trout appear to be elevated above levels causing physiological impairment. However, uncertainties remain regarding effects threshold values and routes of exposure. A continued evaluation of metals concentrations in fish and aquatic invertebrates within OU2 and at reference locations is recommended to determine tissue concentration trends and compare OU2 and background concentrations.

#### 4.4.3.3 Technical Assessment of OU2 Biological Monitoring Plan

Per USEPA guidance (USEPA, 2001b), technical assessment of the OU2 Biological Monitoring Program was evaluated by responding to the following three questions related to protectiveness of the implemented remedial actions:

***Question A: Is the remedy functioning as intended by the decision documents?***

The OU2 biological monitoring portion of the remedy is functioning as intended by the decision documents. Based upon evaluation of the monitoring results to date, the biological monitoring plan should be adaptively refined as described below. The OU2 biological monitoring will be incorporated in the new OU2 Environmental Monitoring Plan, which will also incorporate the water quality monitoring program for OU2.

Based on information collected from 2001-2003, wildlife tissue metal concentrations continue to be elevated above background levels in post remediated areas. Furthermore, tissue metal concentrations in several wildlife groups are above those shown to elicit negative physiological effects, and concentrations in some receptors examined appear to be increasing. Continued monitoring of tissue metals concentrations is vital in evaluating the success of remedial activities through observations of downward trends in tissue concentrations. Further examinations will be conducted to evaluate whether receptors using OU2 with elevated tissue metal concentrations are incurring negative physiological effects. Activities may include the histopathological examination of songbird organs.

Soil appears to be a major route of metal exposure for ecological receptors within OU2. It is unclear whether a lack of reduction in ecological receptor tissue metal concentrations is due to residual effects of pre-remediated metals in the environment. Surface soil and sediment samples are a vital component in examining this issue. Furthermore, few burrowing invertebrates inhabit OU2 post remediated areas. Collection of terrestrial burrowing invertebrates and/or toxicity testing of post-remediated soil invertebrates are needed to evaluate whether surface metal concentrations are protective of invertebrates.

Vegetation monitoring is a necessary component of evaluating the success of remediation activities. Results will provide project managers information regarding success in restoration of remediated areas, and allow them to make decisions regarding necessary steps (i.e., natural attenuation, soil amendments, plantings, etc.) required to achieve remedial goals. As vegetation in remediated areas improves, wildlife species diversity and populations more closely resembling those of unaffected areas would be expected to correspondingly improve. Correlations between future vegetative states and wildlife tissue concentration should continue to be evaluated. As vegetation components within OU2 improve, amphibian use will improve. Observational amphibian surveys will be reinstated to evaluate the repopulation of OU2 wetland areas by amphibian receptors.

Population surveys conducted as part of the 2001-2004 OU2 biological monitoring created a baseline dataset for wildlife utilizing post-remediated OU2 areas. Current wildlife population differences between OU2 and reference areas are in part due to species' vegetation requirements lacking in post-remediated areas. As vegetation in these areas returns to natural states, so will the food and physiognomy required by wildlife species observed in reference areas. Due to the slow pace of forest regeneration and successional development, changes in wildlife populations will not likely be measurable on a yearly basis. Given the anticipated rate of changes, populations will be examined every 5 years rather than conducting annual surveys. Breeding bird and waterfowl surveys are the exception, as they are required as an integral part of a comprehensive evaluation of avian productivity and survival within OU2. Protocols used for bird surveys are nationally based and require annual surveys. This approach is similar to that established in the OU3 BEMP (USEPA, 2004).

### Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

Section 4.1.1 summarizes the ARARs review for the applicable OU2 decision documents. None of the new or revised standards identified in Section 4.1.1 are ARARs or potential ARARs for the Biological Monitoring Program. The OU2 assumptions, cleanup levels and RAOs are still valid but were limited in scope in that they did not address ecological receptors. Therefore, the biological monitoring results should be evaluated to determine if additional actions are warranted.

### Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Yes, additional information collected under the OU2 biological monitoring program may call into question the biological aspects of the remedy protectiveness. The results of the biological monitoring indicate that wildlife tissue metal concentrations continue to be elevated above background levels in remediated areas and, for several wildlife groups, metals concentrations are above those shown to elicit adverse physiological effects. At the same time, vegetation in remediated areas continues to improve and it is expected that wildlife tissue concentrations may improve over time. Therefore, OU2 biological monitoring results will continue to be evaluated to determine if additional actions are warranted.

Since the 1992 OU2 ROD goals do not include protectiveness of ecological receptors, the OU2 biological monitoring remedy issue table below indicates that the monitoring results do not affect current protectiveness. Because additional OU2 remedial actions may be considered within the context of site-wide ecological goals, the biological monitoring results may affect future protectiveness, so the table indicates "Yes" for future protectiveness.

### Remedy Issues

**Table 4-78. Summary of OU2 Biological Monitoring Remedy Issues**

| Remedy Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **Wildlife Tissue Concentrations:** Wildlife tissue metal concentrations appear to continue to be elevated in post remediated areas. | N | Y |
| **Potential Wetland Loss:** Mitigative measures should be considered for wetland loss at West Page Swamp due to expansion of Page Repository. | N | Y |
| **Vegetation:** Vegetation supportive of local bird populations needs additional time to recover. | N | Y |
| **Gulch Monitoring:** Further examination and monitoring at Government, Magnet and Deadwood Gulches is required to evaluate whether post-remediation soil lead concentrations are above levels toxic to songbirds and to determine trends in songbird lead body burdens. | N | Y |
| **Sediment Lead Levels:** Sediment lead levels within the Page Pond area appear to continue to be above toxic threshold levels to waterfowl. | N | Y |
| **Small Mammals:** Metal concentration levels in OU2 small mammals continue to be elevated above reference samples and are indicative of | N | Y |

| Table 4-78. Summary of OU2 Biological Monitoring Remedy Issues | | |
|---|---|---|
| | Affects Protectiveness (Y/N) | |
| Remedy Issues | Current (now to 1 year) | Future (>1 year) |
| elevated exposure. | | |
| **Soil Sampling:** Soil samples have not been routinely collected in post-remediated areas. | N | Y |

## *Recommendations*

| Table 4-79. Summary of OU2 Biological Monitoring Recommendations and Follow-Up Actions | | | | | |
|---|---|---|---|---|---|
| | | | | Follow-up Actions: Affects Protectiveness (Y/N) | |
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Current (now to 1 year) | Future (>1 year) |
| **Potential Wetland Loss:** Mitigative measures should be considered for wetland loss at West Page Swamp due to expansion of Page Repository. | UMG, USEPA | IDEQ, PHD, USEPA | 12/2006 | N | Y |
| **Environmental Monitoring Program:** Incorporate biological monitoring components into revised OU2 Environmental Monitoring Plan. The following previously established activities are recommended for continued biomonitoring within OU2:<br>• Waterfowl blood collection<br>• Songbird blood collection<br>• Small mammal metals evaluation<br>• Fish metals evaluation<br>• Aquatic invertebrate collection<br>• Breeding Bird Surveys<br>• Monitoring Avian Productivity and Survivorship (MAPS)<br>• Page/Swamp Waterfowl Surveys<br>• Page Ponds wetland vegetation mapping<br>In addition, the following activities are recommended to be included in future biomonitoring within OU2:<br>• Songbird histopathology<br>• Surface soil/sediment sampling<br>• Terrestrial invertebrate collection and/or invertebrate soil toxicity testing<br>• Amphibian population monitoring | USEPA | USEPA | 9/2005 | N | Y |

### 4.4.4 Data Management

Environmental monitoring data collected for OU2 and under the OU3 BEMP will be managed in a centralized database repository. Human health-related data will not be included in this database. Environmental data is a strategic, long-term asset that requires a data management system that is stable, accessible, credible, and cost-effective. STORET (short for STOrage and RETrieval) is the USEPA's national web-based repository for historic and future water quality, biological, and physical data. The system is used by states, tribes, the USEPA and other federal agencies, universities, and citizens to access the nation's environmental monitoring data.

The USEPA Region 10 has selected STORET as the data management system because it is the USEPA's environmental data system, it is a non-proprietary system, and it is a cost-effective way to manage the considerable site data. The Region has worked cooperatively with experts in the USEPA Regions 8 and 9 and Headquarters to develop the site-specific STORET website (www.storet.org). The USEPA Region 10 staff and contractors have developed a Coeur d'Alene Basin-specific user-friendly map-based "front-end" application to access data in the national STORET database, using ArcIMS software. ArcIMS applications allow viewing and querying spatial data. The tools provide functions for changing the map display features, querying the spatial and analytical data, and performing spatial analysis.

## 4.5 Performance Evaluation of OU2 Remedy

The remedy being implemented in OU2 is expected to be protective of human health and the environment upon completion, and in the interim, human health exposure pathways that could result in unacceptable risks are being controlled.

In 1995, with the bankruptcy of the Site's major PRP, the USEPA and the State of Idaho defined a path forward for phased remedy implementation in OU2. Phase I of remedy implementation includes extensive source removal and stabilization efforts, all demolition activities, all community development initiatives, development and initiation of an ICP, future land use development support, and public health response actions. Also included in Phase I are additional investigations to provide the necessary information to resolve long-term water quality issues, including technology assessments and pilot studies, evaluation of the success of source control efforts, development of site-specific water quality and effluent-limiting performance standards, and development of a defined O&M plan and implementation schedule. Interim control and treatment of contaminated water and AMD is also included in Phase I of remedy implementation. Phase I remediation began in 1995, and source control and removal activities are near completion.

Phase II of the OU2 remedy will be implemented following completion of source control and removal activities and evaluation of the impacts of these activities on meeting water quality improvement objectives. Phase II will consider any shortcomings encountered in implementing Phase I and will specifically address long-term water quality and environmental management issues. In addition, the ICP and future development programs will be reevaluated as part of Phase II.

The effectiveness evaluation of the Phase I source control and removal activities to meet the water quality improvement objectives of the 1992 OU2 ROD will be used to determine appropriate Phase II implementation strategies and actions. In addition, although the 1992 OU2 ROD goals did not include protection of ecological receptors, additional actions may be considered within the context of site-wide ecological cleanup goals. Both ROD and SSC amendments are required prior to implementation of Phase II remedial actions.

### 4.5.1 Phase I Accomplishments

Since beginning the implementation of the Phase I 1992 OU2 ROD in 1995, a significant amount of remediation work has been conducted. As summarized in Table 4-1, over 3.3 million cubic yards of contaminated waste have been removed and consolidated onsite in engineered closure areas (the Smelter and CIA Closures). The use of geomembrane cover systems on these closure areas effectively removes these contaminated wastes from direct contact by humans and biological receptors. Consolidating these wastes in engineered closures also substantially reduces the exposure pathway to the surface water and groundwater environment in comparison to pre-remediation site conditions.

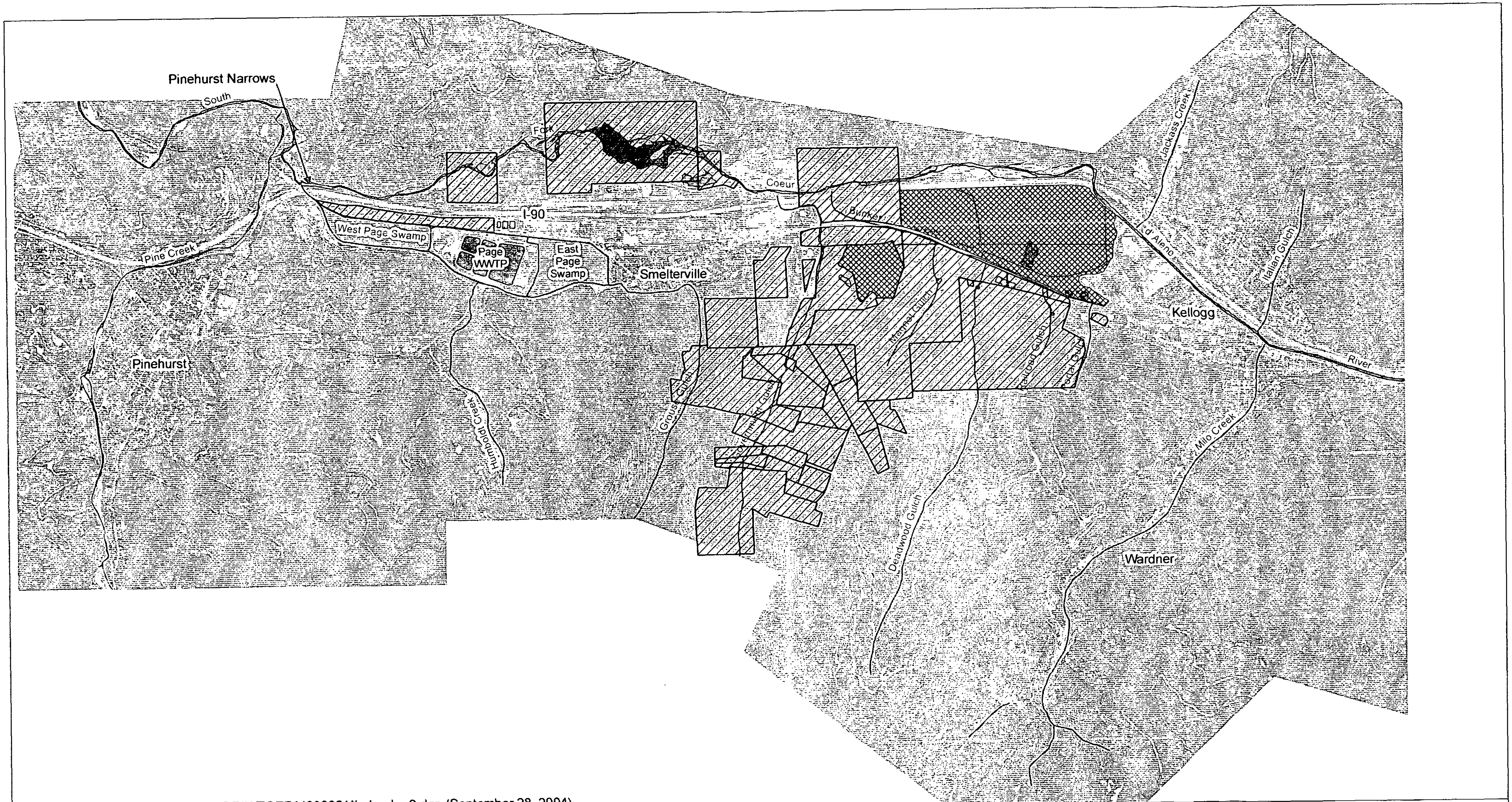
Also, as summarized in Table 4-1, over 800 acres of property within OU2 have been capped to eliminate direct contact with residual contamination that remains in place within some areas of OU2. In addition, the revegetation work conducted as part of the Phase I remedial actions has substantially controlled erosion and significantly improved the visual aesthetics of OU2. The success of the Phase I revegetation efforts is providing improved habitat for wildlife that was largely absent for decades in many areas of the hillsides and Smelterville Flats.

All of these efforts have reduced or eliminated the potential for humans to come in direct contact with soil/source contaminants, have reduced opportunities for transport of contaminants by surface water and air, and are expected to provide surface and groundwater quality improvements over time throughout the Site.

As a direct result of the success of the Phase I source removal and capping activities, 1,799 out of approximately 1,900 acres of property in OU2 that were obtained by the USEPA as part of the Gulf Resources bankruptcy have been conveyed to the State of Idaho for future beneficial use by the communities of the Silver Valley. Figure 4-15 shows the property parcels that have been conveyed to the State of Idaho from 2003 through 2004. As shown, the only remaining USEPA-owned property parcels are those associated with the CIA, the Central Treatment Plant (CCTP), and the Smelter Closure Area (SCA).

### 4.5.2 Evaluation of OU2 Phase I and Path Toward Potential OU2 Phase II Remedy

As noted throughout this Section, Phase I remedial actions are substantially complete, but several remedial components remain to be conducted. In addition, monitoring of the effectiveness of the Phase I remedial actions will continue. The following provides a brief overview of the USEPA and the IDEQ's joint plan for moving forward in conjunction with the Coeur d'Alene Environmental Improvement Project Commission (Basin Commission) to evaluate the effectiveness of the OU2 Phase I remedy and set the stage for potential implementation of an OU2 Phase II remedy.




SOURCE: USACE File: G:*proj*RE*WFOEPA*693051*bgbunker2.dgn (September 28, 2004)

**Legend**

- Parcels Conveyed to State of Idaho (2003, 2004)
- Remaining USEPA-Owned Parcels
- Water Features

N

0 2,500 5,000 Feet

FIGURE 4-15

**OU2 PROPERTY PARCELS CONVEYED TO STATE OF IDAHO BUNKER HILL SUPERFUND SITE**

FIVE-YEAR REVIEW

File Path: Z:\USEnvironmentalProte\321104\GIS\MapDocuments\Mxds\5-Year Review\Figure 4-15.mxd

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### Phase I Evaluation

A comprehensive evaluation of the effectiveness of the OU2 Phase I remedy is currently underway by the USEPA and the IDEQ. The following documents are being developed by the USEPA and the IDEQ to provide a road map to refine understanding of the OU2 environmental system and facilitate Phase II remedy implementation:

- **Revised OU2 Conceptual Site Model (CSM).** The revised CSM will present the current understanding and status of contamination within the OU2 environmental system. Within this document, data gaps and uncertainties associated with the environmental system will be presented. This is a "living" document and will be updated as required to refine the understanding of the OU2 environmental system and to provide a basis for future actions.

- **Statistical Trend Analysis of Groundwater and Surface Water.** A statistical analysis of water quality monitoring data generated as a result of OU2 water quality monitoring is being performed to analyze contaminant data for trends on a location-specific and, to the extent possible, on an OU2-wide spatial basis. Included in this analysis will be an evaluation of correlations between contaminants and parameters measured within OU2.

- **Phase I Remedial Action Characterization.** This characterization of Phase I remedial actions will include identification of the extent of these cleanup activities and their impact on contaminant nature and extent and potential release mechanisms associated with these sources. This document will refine the understanding of remedial actions performed as part of Phase I cleanup activities within OU2.

- **Revised OU2 Environmental Monitoring Plan.** This revised status and trends monitoring plan for groundwater, surface water, and ecological receptors within OU2 will provide data to evaluate the performance of the overall OU2. Remedial action effectiveness monitoring plans are also being developed for the larger Phase I remedial actions. The revised OU2 monitoring plan will coordinate with the OU3 Basin Environmental Monitoring Program and include aforementioned remedial-action-specific monitoring plans of key OU2 actions.

The above documents will be available in early 2006. It is anticipated that under the Basin Commission there may be a Technical Leadership Group (TLG) or Basin Information Forum (BIF) presentation early in 2006 to explain the findings of the above reports and provide an opportunity for discussion. An overview presentation could also be provided at a Basin Commission meeting if so desired.

### OU2 Phase II Remedy Consideration

Following the above evaluation of Phase I remedial actions in OU2, the next step is to further set the stage for consideration of Phase II remedy alternatives. The following evaluations by the IDEQ and the USEPA will facilitate definition of OU2 Phase II.

#### *Identification of OU2 Source Areas of Concern*

Based on the results of the Phase I evaluation, source areas within OU2 will be identified and ranked based upon a set of criteria to be established. The criteria will include a relative contaminant metal loading, impacts on environmental receptors and other factors to be determined. Data gaps that need to be filled to confirm and quantify source areas and their resultant impact on the environmental system may be identified and addressed.

#### *Identification and Evaluation of Potential OU2 Phase II Remedial Actions*

Based on the results of the identification and relative ranking of source areas identified within OU2, conceptual RAs will be developed to address the sources and evaluated based on implementability, effectiveness, and cost of supplemental remedial actions.

Per the motion passed by the Basin Commission in August 2005, the Commission will participate in future Phase II activities in OU2 by providing technical input into the remedy alternative development and selection (including evaluation of technical reports, pilot studies, and feasibility study documents), providing input into the public processes associated with ROD modifications and educating the community and legislative bodies of the need for funding for this work. Both ROD and State Superfund Contract (SSC) amendments would be required prior to implementation of Phase II remedial actions.

### 4.5.3 Full Implementation of the 2001 OU2 ROD Amendment

In addition to evaluating Phase I actions and identifying possible Phase II actions, an SSC amendment that allows for the full implementation of the 2001 OU2 ROD Amendment needs to be negotiated and signed. Time-critical components of this ROD amendment were implemented to prevent catastrophic failure of the Central Treatment Plant (CTP) and discharges of AMD to Bunker Creek and the SFCDR. Until an SSC is signed, however, control and treatment of AMD and its impact on water quality will continue to be an issue. The USEPA and the State of Idaho continue to discuss the SSC amendment and the long-term obligations associated with the mine water remedy.

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# 5 Review of Selected Remedies for OU3

This section documents studies and remedial activities within the Operable Unit 3 (OU3) boundary that have been conducted both before and after the issuance of the September 2002 OU3 interim Record of Decision (ROD) (USEPA, 2002a). The information in this section is organized as follows:

- 5.1 Overview of the OU3 Selected Remedy
- 5.2 Review of Applicable or Relevant and Appropriate Requirements (ARARs)
- 5.3 OU3-Wide Considerations
- 5.4 Status of Removal Actions (removal actions are actions initiated prior to the issuance of a ROD and address specific high-risk human health and/or environmental concerns)
- 5.5 Review of Site-Specific Work and Remedial Actions (initiated after the issuance of the 2002 OU3 interim ROD)
- 5.6 Environmental Monitoring
- 5.7 Coeur d'Alene Lake
- 5.8 Trail of the Coeur d'Alenes
- 5.9 Performance Evaluation of OU3 Remedy
- 5.10 References

Figure 5-1 is a site map of OU3, and Figure 5-2 is a timeline of important events.

## 5.1 Overview of OU3 Selected Remedy

On September 12, 2002, the U.S. Environmental Protection Agency (USEPA) issued an interim ROD to address mining contamination in the broader Coeur d'Alene Basin (OU3) (USEPA, 2002a). The cleanup plan resulted from several years of intensive studies to determine the extent of contamination and the associated risks to people and the environment. The 2002 OU3 interim ROD (hereafter "2002 OU3 ROD") describes the specific cleanup work, called the interim Selected Remedy (hereafter "the remedy") that will occur in the Basin at a cost of about $360 million over approximately the next thirty (30) years. The following governments and agencies in the areas targeted for cleanup gave their support for conducting the cleanup selected in the 2002 OU3 ROD: the State of Idaho, the Coeur d'Alene Tribe, the Spokane Tribe, the State of Washington, the U.S. Bureau of Land Management (BLM), the U.S. Fish and Wildlife Service (USFWS), and the U.S. Forest Service (USFS).

The 2002 OU3 ROD represents a significant step toward meeting the goal of full protection of human health and the environment in the Basin. The cleanup plan includes:

- The full remedy needed to protect human health in the community and residential areas, including identified recreational areas of the Upper Basin and Lower Basin, as well as Washington recreational areas along the Spokane River upstream of Upriver Dam; and,
- An interim remedy of prioritized actions for protection of the environment that focus on improving water quality, minimizing downstream migration of metal contaminants, and improving conditions for fish and wildlife populations.

Certain potential exposures to human health outside of the communities and residential areas of the Upper Basin and Lower Basin were not addressed by the 2002 OU3 ROD. These potential exposures impacting human health include:

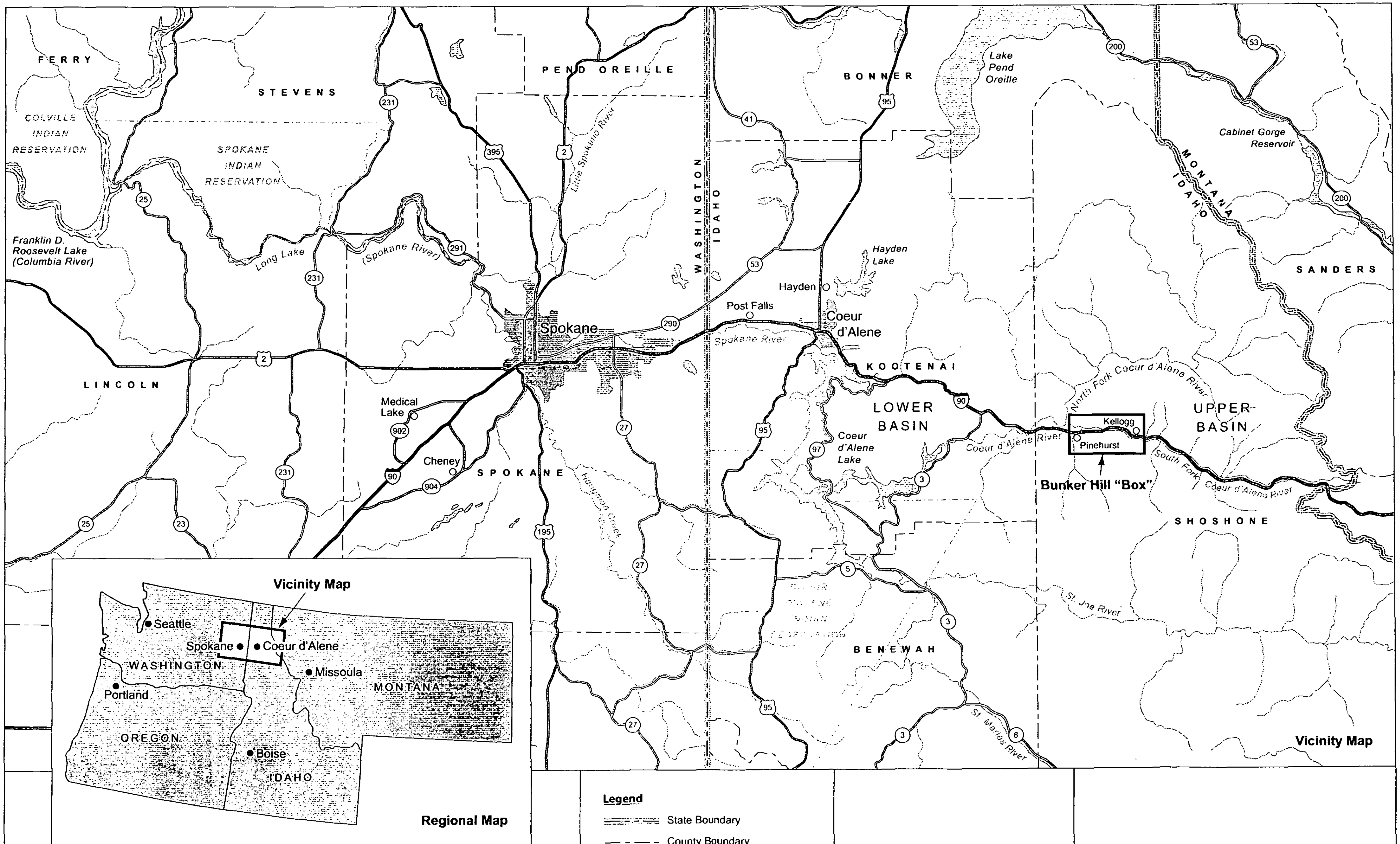
- Recreational use at areas in the Upper Basin and Lower Basin where cleanup actions are not implemented pursuant to the 2002 OU3 ROD;
- Subsistence lifestyles, such as those traditional to the Coeur d'Alene and Spokane Tribe; and
- Potential future use of groundwater that is presently contaminated with metals.

In addition, a remedy for Coeur d'Alene Lake is not included in the 2002 OU3 ROD. State, tribal, federal, and local governments are in the process of developing a revised lake management plan outside of the Superfund process using separate regulatory authorities.

The USEPA's first priority for implementation of the 2002 OU3 ROD is to remediate residential and recreational areas that pose direct human health risks. Subsequent actions will include cleanup of areas that pose ecological risks. EPA Region 10 has received funding for implementation of the OU3 human health remedy. The Region will continue to work with EPA Headquarters and other parties to secure funding for full implementation of the 2002 OU3 ROD.

Idaho state legislation under the Basin Environmental Improvement Act (Title 39, Chapter 810) established the Coeur d'Alene Basin Environmental Improvement Project Commission (Basin Commission). This commission includes federal, state, tribal, and local governmental involvement. The USEPA serves as the federal government representative to the Basin Commission and will continue to work closely with the governments and communities as they implement the cleanup plan. The USEPA will continue to be responsible for ensuring that the cleanup work meets the requirements of the 2002 OU3 ROD as well as Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) laws and regulations.

The National Academies' National Research Council (NRC) is conducting an independent evaluation of the Coeur d'Alene Basin to examine the USEPA's scientific and technical practices in Superfund site characterization, human and ecological risk assessment, remedial planning, and decision-making. The NRC is an independent, nongovernmental institution that advises the nation on scientific, technical, and medical issues. The Idaho Congressional delegation requested that the study be performed and Congress mandated that the USEPA fund the study at a cost of $850,000. The NRC convened the Committee on Superfund Site Assessment and Remediation in the Coeur d'Alene Basin, comprised of members with a wide range of expertise and backgrounds.




NOTE: OU3 consists of mining-contaminated areas in the Coeur d'Alene River corridor outside of OU1 and OU2, primarily adjacent floodplains, downstream water bodies, tributaries (including Coeur d'Alene Lake and the Spokane River), and fill areas.

**Legend**

- State Boundary
- County Boundary
- Indian Reservation Boundary
- Interstate Highway
- U.S. Highway
- State Highway

N

0 5 10 15 Miles

FIGURE 5-1

**OU3 SITE MAP**

FIVE-YEAR REVIEW

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**Table 5-57. OU3 Basin Environmental Monitoring Plan Summary (Excerpt from USEPA, 2004)**

| | | | | | | | | | Biological Resources | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Riverine | | | | | | | | Lacustrine/ Palustrine | | | Riparian | | |
| | | | Surface Water | | | Sediment | | | Fish | | | | Macroinvertebrates | | | Habitat | Waterfowl | | | Habitat | Songbirds | |
| Location | Station Type | USGS Gauging Station Type | Sentinel Monitoring | Benchmark Monitoring | Low Flow | Surficial In-Channel Sampling | Suspended Sediment (part of SW Sampling) | In-Channel, Lacustrine, Palustrine& Riparian | Diversity/ Abundance | Tissue Metals Levels | Bull Trout Habitat Assessment[2] and Other Aquatic Resources | Bull Trout Pop. Survey[2] and Other Aquatic Resources | Diversity/ Abundance | | Tissue Metals Levels | Aquatic Habitat Quality Assessment | Population Survey | Mortality Survey | Blood Lead | Riparian Veg. + Inverts | Diversity/ Abundance | Blood Lead |
| | | | Annual | 5 Years | Annual | Annual | Annual | 10 Years | 5 Years | 5 Years | Years 1 & 2 only | 5 Years | 2 per 5 years | 5 Years | 5 Years | 5 Years | 2 per 5 years | 5 Years | 5 Years | 5 Years | 5 consec. yrs. every 10 yrs. | 5 Years |
| SFCDA above Canyon Creek | Benchmark | Std. | | X | X | X | | | | | | | | | | | | | | | | |
| Mouth of Canyon Creek | Benchmark | Std. | | X | X | X | X | | | | | | | | | | | | | | | |
| Ninemile Drainage | | | | | | | | X | X | X | | | | X | X | X | | | | X | X | X |
| Mouth of Ninemile Creek | Benchmark | Std. | | X | X | X | X | | | | | | | | | | | | | | | |
| Upper E. Fork Ninemile Creek | Benchmark | Std. | | X | X | X | X | | | | | | | | | | | | | | | |
| Lower E. Fork Ninemile Creek | Benchmark | Std. | | X | X | X | X | | | | | | | | | | | | | | | |
| SFCDA Drainage (Wallace-Eliza. Park) | | | | | | | | X | X | X | | | | X | X | X | | | | X | X | X |
| Elizabeth Park (above Box) | Sentinel | Std. | X | | X | X | X | | | | | | X | | | | | | | | | |
| Smelterville | Sentinel | Misc. | X | | X | X | X | | | | | | | | | | | | | | | |
| Pine Creek Drainage | | | | | | | | X | X | X | | | | X | X | X | | | | X | X | X |
| Pine Creek below Amy Gulch | Benchmark | Real-time | | X | X | X | X | | | | | | | | | | | | | | | |
| SFCDA at Pinehurst (below Box) | Sentinel | Real-time | X | | X | X | X | | | | | | X | | | | | | | | | |
| NFCDA at Enaville | Sentinel | Real-time | X | | X | X | X | | | | | | X | | | | | | | | | |
| Lower Basin | | | | | | | | X | | | X | X | | | | | X | X | X | X | X | X |
| Cataldo | Benchmark | Real-time* | | X | X | X | | | | | | | | | | | | | | | | |
| Rose Lake | | NA | | | | X | | | | | | | | | | | | | | | | |
| Medimont | | NA | | | | X | | | | | | | | | | | | | | | | |
| Harrison | Sentinel | Real-time/ SS | X | | X | X | | X[1] | | X | | | | | | | | | | | | |
| Spokane River depositional areas | | | | | | | | X | | | | | | | | | | | | | | |
| Spokane River at Outlet | Sentinel | Misc. | X | | X | | X | | | | | | | | | | | | | | | |
| Spokane River at Post Falls | | Std.* | | | | | | | | | | | | | | | | | | | | |
| Spokane River at Stateline | Benchmark | Misc. | | X | X | X | X | | X | X | | | | X | X | X | | | | | | |
| Upriver Dam Reservoir or Long Lake Pools | | NA | | | | | | X[1] | | | | | | | | | | | | | | |
| Near Eastern Boundary of Spokane Reservoir | | NA | | | | X | | | | | | | | | | | | | | | | |
| St. Joe River at Mouth near Chatcolet | Sentinel | Real-time/ SS | X | | X | | X | | | | | | | | | | | | | | | |

Notes:
Surface water samples to be analyzed for total and dissolved metals (Cd, Pb, Zn), suspended sediment, and nutrients.
Gauging station types:
- Standard - recording equipment that needs the data to be physically downloaded
- Real-time - satellite transmission of recording data
- Real-time/SS - satellite transmission of recording data plus suspended sediment data
- Miscellaneous - no actual gauging station but can measure instantaneous flow and estimate hourly flow

* Funded by Idaho Water Resources
[1] Surface sediment sampling of Harrison delta and Upriver/Long Lake pools using a core sampler
[2] Bull trout habitat assessment to be performed only in years 1 and 2 in the Mainstem CDA River and downstream areas of the SFCDR. Surveying (electroshocking) locations will be identified based on habitat assessment (i.e. areas of cold refuge).

**Table 5-58. OU3 Basin Environmental Monitoring Plan Monitoring Schedule (Excerpt from USEPA, 2004)**

| | | Year | 2004 | 2005* | 2006 | 2007 | 2008 | 2009 | 2010* | 2011 | 2012 | 2013 | 2014 | 2015* | 2016 | 2017 | 2018 | 2019 | 2020* | 2021 | 2022 | 2023 | 2024 | 2025* | 2026 | 2027 | 2028 | 2029 | 2030* | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Media/Organism** | **Activity** | **Location** | **Y1** | **Y2** | **Y3** | **Y4** | **Y5** | **Y6** | **Y7** | **Y8** | **Y9** | **Y10** | **Y11** | **Y12** | **Y13** | **Y14** | **Y15** | **Y16** | **Y17** | **Y18** | **Y19** | **Y20** | **Y21** | **Y22** | **Y23** | **Y24** | **Y25** | **Y26** | **Y27** | **Y28** | **Y29** | **Y30** |
| **Surface Water** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sentinel stations + annual low flow sampling | | 7 stations/ 15 stations | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Benchmark stations | | 8 stations | | | | | X | | | | | X | | | | | X | | | | | X | | | | | X | | | | | X |
| **Sediment** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Surficial sediment sampling + suspended sediment | | 16 areas | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Broader sediment sampling + coring | | 7 areas | | | | | | X | | | | | | | | | | X | | | | | | | | | | X | | | | |
| **Biological Resources** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Waterfowl | Population survey | Lower Basin | | X | X | X | | | | X | X | | | | X | X | | | | X | X | | | | X | X | | | | X | X | |
| Waterfowl | Mortality Survey | Lower Basin | | | | X | | | | | X | | | | | X | | | | | X | | | | | X | | | | | X | |
| Waterfowl | Blood Lead | 4 stations | | | | | X | | | | | X | | | | | X | | | | | X | | | | | X | | | | | X |
| Songbird | Blood Lead | 5 stations | | | | | | | X | | | | X | | | | X | | | | | | X | | | | | X | | | | |
| Songbird | Population survey | 2 MAPs | X | X | X | X | X | | | | | | X | X | X | X | X | | | | | | X | X | X | X | X | | | | | |
| Riparian spp. | Riparian habitat | 5 stations | | | X | | | | | X | | | | | X | | | | | X | | | | | X | | | | | X | | |
| Aquatic Invertebrate | Diversity/abundance | 3 locations | X | X | | | | X | X | | | | X | X | | | | X | X | | | | X | X | | | | X | X | | | |
| Aquatic Invertebrate | Diversity/abundance | 3 (or 4) additional locations | | X | | | | | X | | | | | X | | | | | X | | | | | X | | | | | X | | | |
| Aquatic Invertebrate | Tissue residues | 4 locations | | X | | | | | X | | | | | X | | | | | X | | | | | X | | | | | X | | | |
| Fish and invertebrate | Habitat assessment | 3 locations (or 4) | | X | | | X | | | | | X | | | | | X | | | | | X | | | | | X | | | | | X |
| Fish | Diversity/abundance | 4 locations | | | X | | | | | X | | | | | X | | | | | X | | | | | X | | | | | X | | |
| Fish | Tissue residues | 4 locations | | | X | | | | | X | | | | | X | | | | | X | | | | | X | | | | | X | | |
| Bull trout | Habitat/temperature assessment | S.F.CDA and Mainstem | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bull trout | Population survey | Areas of cold refuge | | X | | | | | X | | | | | X | | | | | X | | | | | X | | | | | X | | | |
| **Reporting** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Annual data report/assessment | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Tech memo to support five-year review report preparation | | | | | | | | | X | | | | | X | | | | | X | | | | | X | | | | | X | | | |

Notes:

* Indicates the year that five-year reviews will need to be completed.

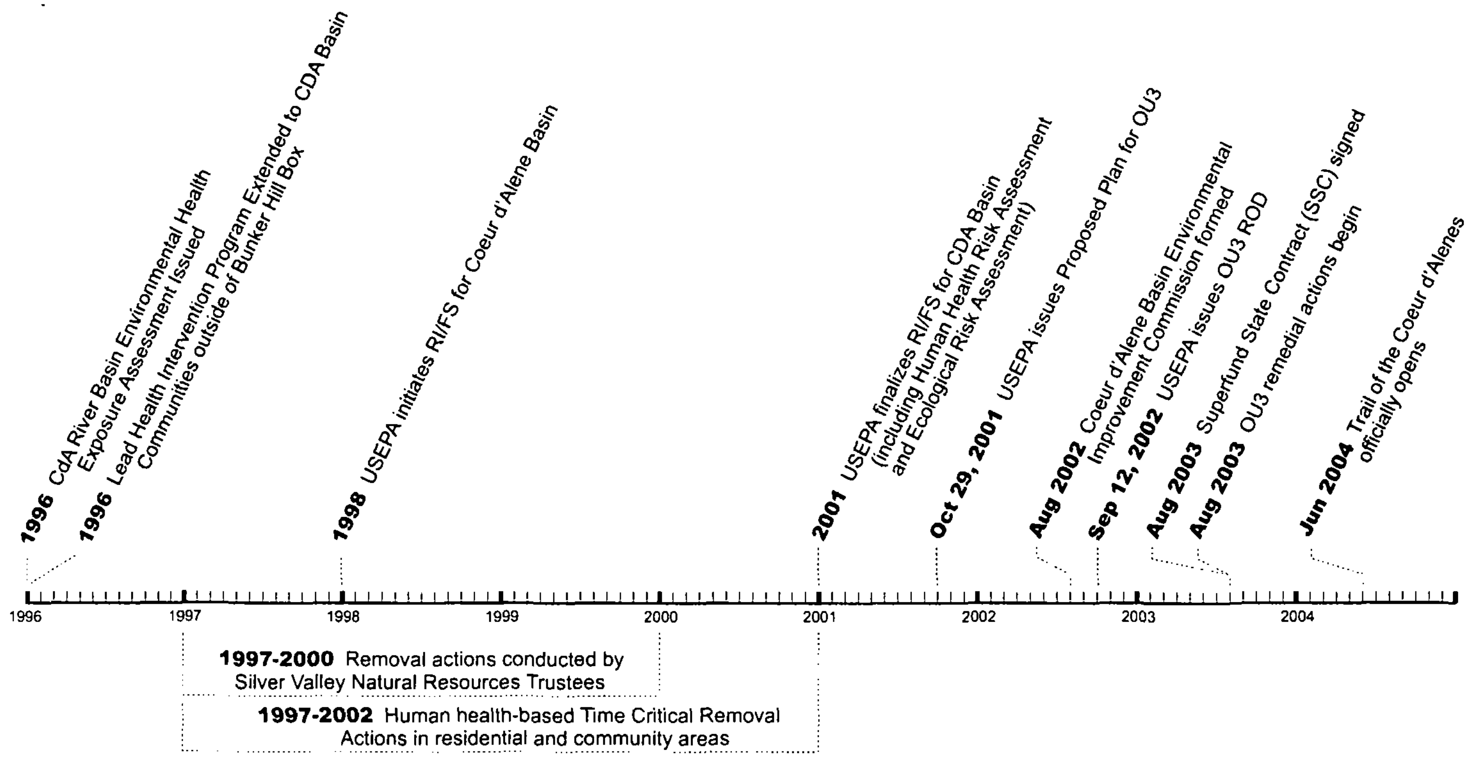



FIGURE 5-2
**OU3 TIMELINE**
**BUNKER HILL SUPERFUND SITE**
FIVE-YEAR REVIEW

The NRC study began in June 2003. During the study, the NRC held public sessions in Washington, D.C.; Wallace, Idaho; and Spokane, Washington. On July 14, 2005, the NRC released a pre-publication version of its report (see www.nas.edu, search on "coeur") (NRC, 2005). The pre-publication report reflects unanimous consensus of the Committee and has undergone a rigorous peer review process. On July 15, 2005, the NRC hosted a public meeting at the North Idaho College in Coeur d'Alene to share the report findings and answer questions from the public. The final NRC report will be published in book form in December 2005.

The USEPA is conducting a careful review of the NRC pre-publication report recommendations and findings. The USEPA, along with others invested in the issues, are considering the NRC report's recommendations and, where appropriate, will translate those findings into action. Region 10 remains committed to work closely with the Coeur d'Alene Basin Commission, as well as the Commission's Technical Leadership Group (TLG) and Citizens' Coordinating Council (CCC).

### 5.1.1 Overview of Selected Human Health Remedy

The Selected Remedy includes the complete remedy for human health protection in the community and residential areas, including identified recreational areas of the Upper Basin and Lower Basin. In addition, for the Spokane River in Washington, the remedy includes the complete remedy for human health protection upstream of Upriver Dam. The remedy for these areas is described in Sections 12.1 and 12.4 of the 2002 OU3 ROD (USEPA, 2002a).

Certain potential exposures outside of the community and residential areas of the Upper and Lower Basin were not addressed by the 2002 OU3 ROD. These potential human health exposures include recreational use at areas where cleanup actions are not implemented pursuant to the ROD, subsistence lifestyles such as those traditional to the Coeur d'Alene and Spokane Tribes, and potential future use of groundwater presently contaminated with metals.

A primary goal of the human health cleanup is to prevent people (particularly young children and pregnant women) from coming into contact with unhealthy levels of metals. Children under 7 years of age and pregnant women are the most at risk from exposure to lead and other metals. Young children are primarily exposed to lead through normal hand-to-mouth activities that cause them to ingest house dust, which is often contaminated with lead from exterior soil or other sources such as lead-based paint (Succop et al., 1998; Manton et al., 2000; Lanphear et al., 2002). The 2002 OU3 ROD describes the actions needed to reduce children's exposure to lead through soil and dust "pathways." The 2002 OU3 ROD also describes actions to reduce human exposure to other metals in soil and private drinking water sources. Cleanup in residential and community areas has been prioritized for completion and will be completed as soon as possible, depending on funding and property owner participation.

In 2003, the Basin Commission approved a one-year plan and five-year plan that included implementation of residential and recreational area cleanup activities (Basin Commission, 2003a and 2003b). The Idaho Department of Environmental Quality (IDEQ) is the lead agency for implementation of the residential and community area cleanup, with USEPA funding and oversight. The USEPA is the lead agency for cleanup of the recreational areas.

#### 5.1.1.1 Residential and Common-use Areas

The OU3 residential cleanup program includes:

- Voluntary testing of residential soils and informing property owners of their sample results;
- Partial removal and replacement of surface soils that have metal levels greater than 1,000 milligrams per kilogram (mg/kg) lead or 100 mg/kg arsenic, and enhancement of barriers, such as vegetation, for soils between 700 and 1,000 mg/kg lead. No cleanup is required for soils below 700 mg/kg lead and 100 mg/kg arsenic;
- Evaluation of interior cleaning for homes where the house dust lead levels remain elevated after soil cleanup;
- Testing of private drinking water wells and provision of safe drinking water for homes with contamination above 2002 OU3 ROD action levels; and
- Implementation of a lead health education and intervention program to provide health and hygiene information to families as well as a free high-efficiency particulate air filter (HEPA) vacuum cleaner loan program to limit exposure to household dust. In addition, the annual blood lead screening program will continue in the Basin.

***Identified Recreational Areas on the Coeur d'Alene River***

The 2002 OU3 ROD identifies recreational areas near the Coeur d'Alene River (campgrounds, picnic areas, boat ramps) that have been prioritized for cleanup. The contaminated soil at these areas will either be capped or removed, depending on the area. In addition, lead health information and signs have been placed at several recreational use areas in the Basin.

***Information for Fishermen***

Education and information, including health advisories, will be provided to fishermen to advise them of the potential risks associated with eating fish from areas of concern. The advisories will be provided in alternative language formats, as required.

***Institutional Controls Program***

Institutional controls (ICs) are required to protect the remedy over time when contaminants are left in place. The existing Institutional Controls Program (ICP) in Operable Unit 1 (OU1) and Operable Unit 2 (OU2), which is implemented by the Panhandle Health District (PHD), is being used as a model for the Basin.

### 5.1.2 Ecological Cleanup Actions

The remedial actions (RAs) selected for environmental protection in the Upper and Lower Basin are described in Section 12.2 of the 2002 OU3 ROD and summarized in Table 12.2-1 of the ROD (USEPA, 2002a). For protection of the environment, three environmental priorities were identified in the 2002 OU3 ROD:

- Dissolved metals in surface water (particularly zinc and cadmium): high concentrations of these metals have harmful effects on fish and other aquatic life;

- Lead in soil and sediment: existing elevated lead concentrations in the beds, banks, and floodplains of the river system have harmful effects on waterfowl and other wildlife; and
- Particulate lead in surface water: lead transported downstream is a continuing source of contamination for the Coeur d'Alene River, Coeur d'Alene Lake, and the Spokane River. Lead transported in particulate form in the river has impacted recreational areas in the Lower Basin and the Spokane River, resulting in posted health advisory signs at beaches and swimming areas. During flood events, lead transported by the river also impacts the wetlands, floodplains, waterfowl, and other wildlife.

The 2002 OU3 ROD summarizes priority cleanup actions to implement over the next 30 years, maximizing environmental protection and cost-effectiveness. As discussed in more detail in Section 5.2 of this report, during this 30-year implementation period, the USEPA will evaluate the effectiveness and protectiveness of the remedial actions as well as the technical practicality of attaining ARARs. The following benefits are anticipated from implementation of the ecological component of the remedy:

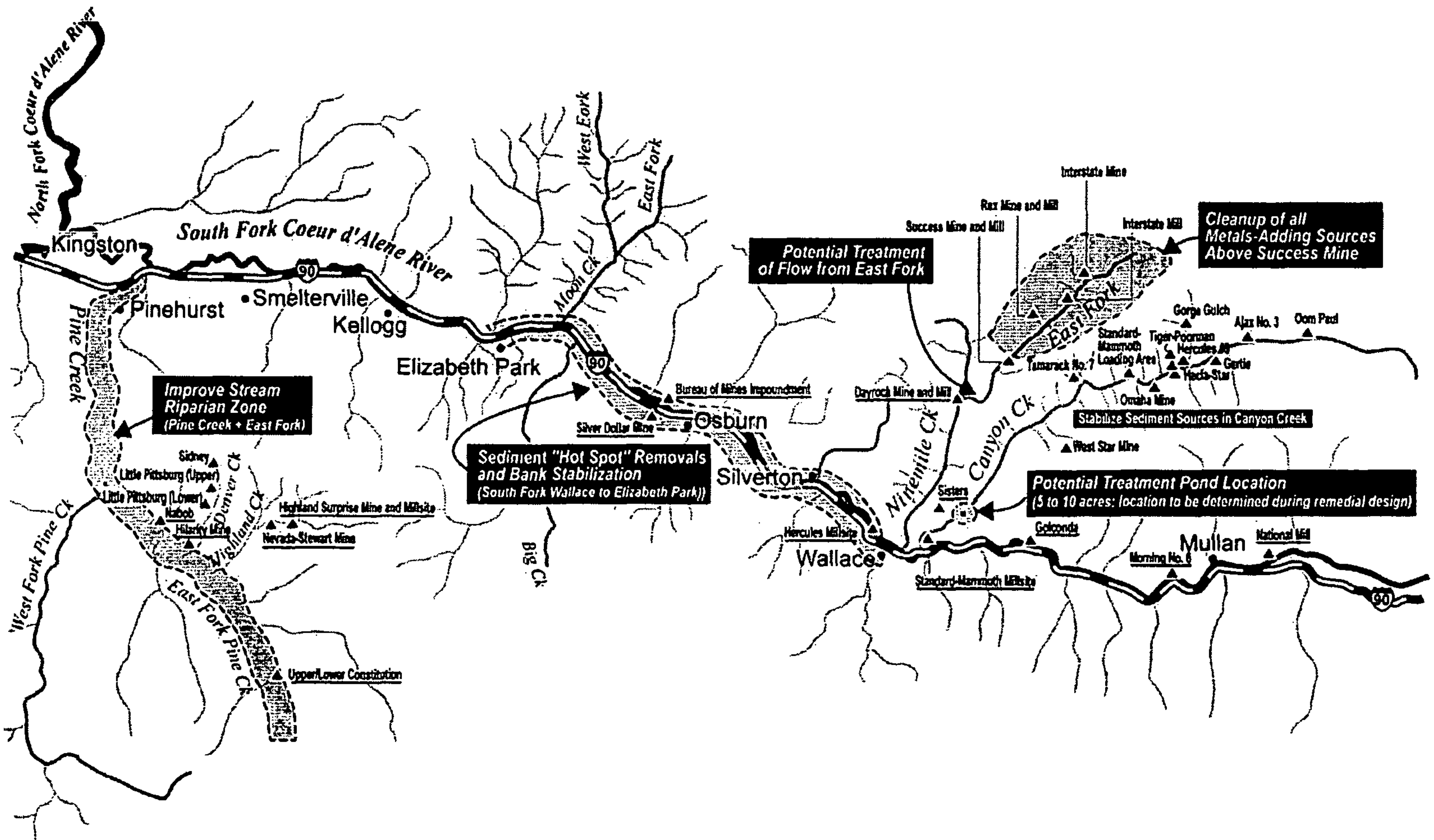
- Reduction of an estimated 580 pounds per day of dissolved zinc loads into the Coeur d'Alene River system from the Upper Basin and Lower Basin;
- Addition of 2,669 acres of safe wetland feeding area and 1,859 acres of safe shallow-lake waterfowl feeding area in the lateral lakes; and
- Reduction of particulate lead moving downstream and improvement of wildlife areas by biostabilizing 33 miles of the most actively eroding Coeur d'Alene River banks and removing up to 2.6 million cubic yards (cy) of contaminated river bed sediments from natural depositional areas (such as near Dudley).

The following section provides a brief overview of the 2002 OU3 ROD ecological cleanup actions in the Upper and Lower Basin.

#### 5.1.2.1 Upper Basin

##### *Canyon Creek*

Canyon Creek contributes more dissolved metals load to the South Fork of the Coeur d'Alene River (SFCDR) than any other tributary—approximately 20 to 25 percent of the load in the South Fork at its confluence with the North Fork. Cleanup of individual sources in Canyon Creek would be very difficult, costly, and time-consuming. The goal in the 2002 OU3 ROD for Canyon Creek is to substantially reduce, by at least 50 percent, dissolved metals loads discharging from the creek into the South Fork. One potentially cost-effective approach for Canyon Creek would be to intercept the creek water in lower Canyon Creek and remove metals using treatment. Before a treatment technology is selected for Canyon Creek, bench-scale and pilot testing is being done to assess technology effectiveness and the agencies will seek public input on approaches and design details. Construction of a treatment system will not begin for several years. For more details about the Canyon Creek Treatability Study, please refer to Section 5.5.3.1 of this document. Canyon Creek cleanup also includes stabilizing mine dumps and stream banks that are sources of sediment and particulate metals in the creek (Figure 5-3).




## Legend

Cleanup actions at dispersed streambank locations

Golconda ▲ Mining-related site identified for cleanup. Underline denotes site has potential for human health exposures

N

0 1 2 3 4 5 Miles

FIGURE 5-3

**UPPER COEUR D'ALENE BASIN CLEANUP ACTIONS BUNKER HILL SUPERFUND SITE**

FIVE-YEAR REVIEW

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### Ninemile Creek

The emphasis in Ninemile Creek is on improving water quality by reducing existing sources of metals loading to the creek. A goal is to re-establish a resident fishery above Success Mine and a fish migration corridor below Success Mine. The major contributing sources of contamination in Ninemile Creek are the Interstate, Rex, and Success mine and mill sites. The State of Idaho and the mining companies are already doing some work at these sites. Work to date has included moving contaminated materials out of the creek flood plain and diverting and treating contaminated groundwater from the Success tailings pile to reduce metals content.

Under the 2002 OU3 ROD, these actions will be evaluated for their effectiveness.

If these actions do not meet the 2002 OU3 ROD goals for reducing the metals loading to the creek, additional cleanup work may be called for. Future work may include (Figure 5-3):

- Removing and relocating tailings piles;
- Capping tailings piles;
- Stabilizing stream banks;
- Installing a surface water treatment pond in the lower portions of Ninemile Creek; and
- Implementing measures to address protection of human health at the Day Rock mine and mill site.

### Pine Creek

The BLM has already completed considerable cleanup work in the Pine Creek watershed. Pine Creek currently supports an adult fishery, including brook trout and a smaller population of native cutthroat trout. However, populations and reproduction in some reaches of the creek are limited due to mining-impacted habitats and metals concentrations. The long-term goals for Pine Creek include the return of a native fishery and protecting birds and other animals. The goal in the 2002 OU3 ROD at Pine Creek is to improve conditions to allow natural increases in salmonid populations, with an emphasis on native fish, and to improve conditions to allow for spawning and rearing. The actions implemented by the USEPA in the Pine Creek watershed would add to the work already conducted by the BLM. Actions would include bank and bed stabilization and near-stream revegetation to mitigate the effects of mining impacts. The actions would also include hot spot removals within the stream and at former mine and mill sites. Several of these sites (Upper and Lower Constitution, Highland Surprise, Nevada-Stewart, and Hilarity) also have potential human health risks for recreational users.

### South Fork of the Coeur d'Alene River

In the floodplain of the South Fork (in areas outside of OU1 and OU2), tailings "hot spots" will be excavated and properly disposed. An estimated 102,000 cy of tailings will be removed along the South Fork (Figure 5-3). Streamside actions will include stabilizing the stream channel and banks to reduce erosion. The 2002 OU3 ROD and Figure 5-3 of this document identify six sites along the South Fork that have potential human health risks and ecological impacts. Work at these sites will include excavating material, capping, and grading.

#### 5.1.2.2 Lower Basin

***Lead in Floodplains Soil and Sediment***

Approximately 95 percent of the area covered by wetlands and shallow lakes in the Lower Basin has sediment with lead concentrations that are toxic to waterfowl. Resource agencies identified priority areas for cleanup in the Lower Basin based on heavy use by waterfowl, high levels of lead in sediments, accessibility, and relatively low potential for recontamination.

In total, about 4,500 acres of safe waterfowl feeding areas will be provided by the cleanup actions specified in the 2002 OU3 ROD. About 3,000 acres of priority wetland areas will be remediated as identified in the ROD and shown in Figure 5-4 of this document. A combination of remedial approaches is envisioned for these wetland areas and will depend on the specific site conditions.

The cleanup will include a combination of consolidating contaminated sediment, capping contaminated areas with clean material, and amending soils to reduce the toxicity to waterfowl. In addition, a goal of the interim remedy is to increase the amount of safe feeding areas by identifying and cleaning up approximately 1,500 acres that are currently used for agriculture. These actions would only be done with the agreement and cooperation of the current property owners

***Lead in Surface Water***

Three sources are suspected to contribute to movement of lead in the Lower Basin: sediments from the Upper Basin, contaminated riverbank sediments in the Lower Basin, and riverbed sediments in the Lower Basin. The banks in many areas of the Lower Basin are steep and actively eroding into the river. Initially, cleanup actions will focus on removing contaminated material from the most actively eroding riverbanks in the Lower Basin. The areas for bank stabilization will be prioritized based on the degree of erosion occurring and the concentrations of metals in the riverbank sediments. There are Clean Water Act Grant studies currently underway that will increase understanding of the impacts of bank stabilization on the river bed. In addition, the 2002 OU3 ROD calls for removing up to 2.6 million cy of contaminated sediment from the natural deposition areas such as near Dudley.

### 5.1.3 Coeur d'Alene Lake

A remedy for Coeur d'Alene Lake is not included in the 2002 OU3 ROD (USEPA, 2002a). State, tribal, federal, and local governments are currently in the process of developing a revised lake management plan outside of the Superfund process using separate regulatory authorities.

### 5.1.4 Spokane River

The 2002 OU3 ROD (Section 12.4) does not identify any areas needing cleanup on the Idaho portion of the Spokane River. For the Spokane River in Washington State, a limited number of sediment and soil areas in and adjacent to the Spokane River have been identified for

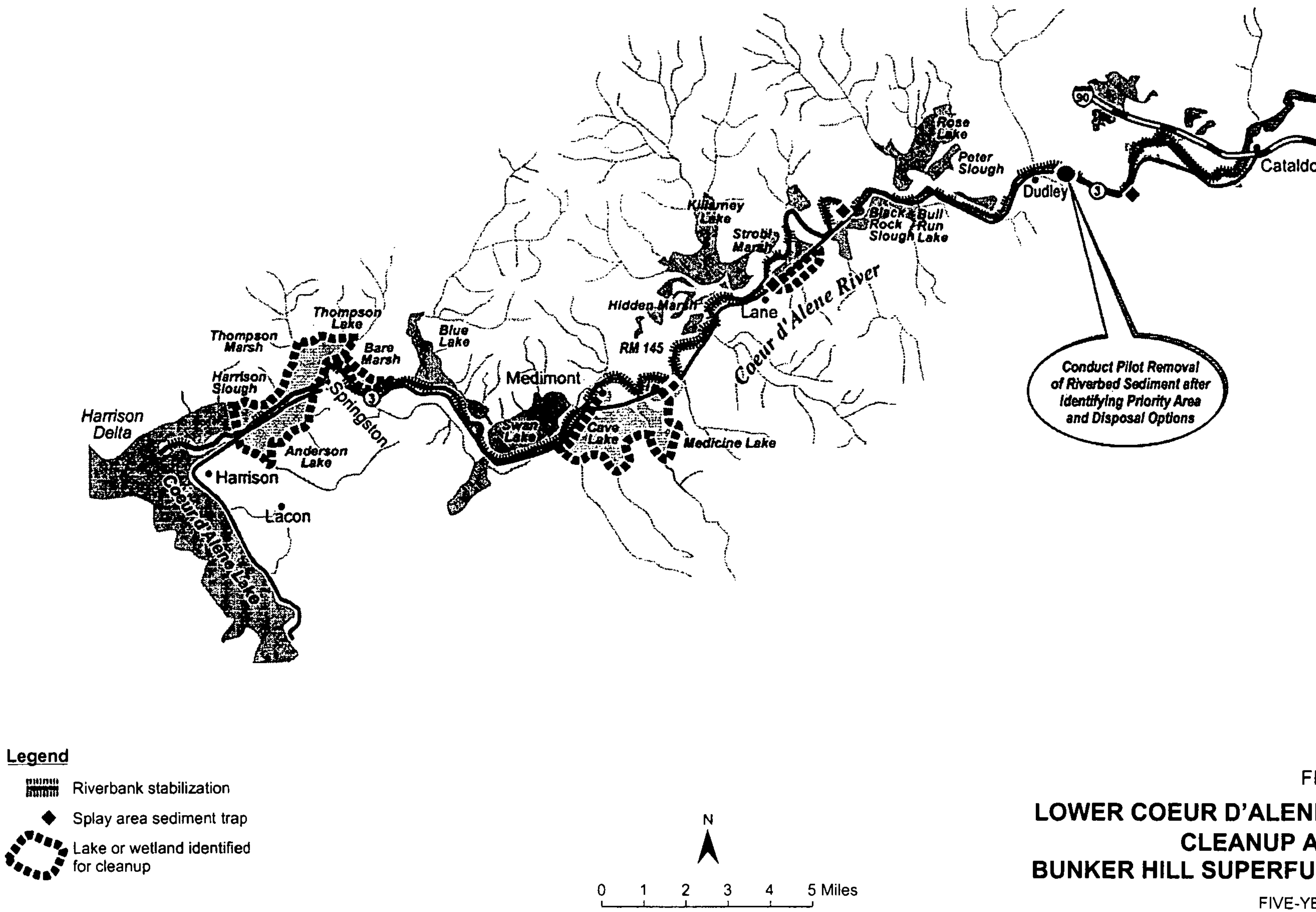



FIGURE 5-4

**LOWER COEUR D'ALENE BASIN CLEANUP ACTIONS BUNKER HILL SUPERFUND SITE**

FIVE-YEAR REVIEW

E112004005SEA 321104.FR.01 5-4 Lower Basin Cleanup Actions 25mar05 gr cleanup on the basis of potential human and ecological risks. These areas are located along a 16-mile reach of the river between the Idaho/Washington state line and Upriver Dam, which is upstream of the city of Spokane (Figure 5-5).

The identified areas include ten shoreline areas and one subaqueous area where contaminated sediments have accumulated directly behind Upriver Dam. A range of estimated costs was developed for cleanup of these areas. The lower range was developed based on capping of contaminated sediments. The upper range was developed based on excavation and disposal of contaminated sediments (USEPA, 2002a).

### 5.1.5 Repositories for Material Generated by Cleanup Actions in OU3

Cleanup in the Basin will require construction of repositories for disposal of metals-contaminated soils, sediments, source materials, treatment residuals, and contaminated soils moved by residents or their contractors. The number and size of repositories to accommodate the estimated volumes will be determined during the remedial design phase.

All locations will be evaluated using criteria provided in the 2002 OU3 ROD, which include: proximity to cleanup areas, background environmental conditions, site conditions, and impacts to groundwater, etc. All locations will also be subject to long-term institutional controls and monitoring to ensure the integrity of the repositories. Public involvement processes are one of the primary components for the siting and design of all repositories.

The 2002 OU3 ROD (Section 12.5) notes that estimated volumes of material that may require excavation and disposal are about 500,000 to 900,000 cy of material in the Upper Basin and up to 2.6 million cy in the Lower Basin. By comparison, there are currently about 2.1 million cy of tailings in the Hecla-Star Tailings Ponds in lower Canyon Creek, about 13.6 million cy of dredge spoils in the Mission Flats area, and about 26 million cy of waste material in the Central Impoundment Area located in OU2.

Current repository operations in support of cleanup actions are occurring at Big Creek Repository. This site has been operated since 2002 and has sufficient capacity to continue accepting fill from cleanup actions at the current rate through the 2007 construction season.

There are currently no repositories established to accommodate wastes generated by citizens or contractors working on private property. No issues have been identified as a result, but there is an imminent need for this waste disposal facility.

## 5.2 ARARs Review

The 2002 OU3 ROD includes a complete remedy for protection of human health in the communities and residential areas, including identified recreational areas of the Upper Basin and Lower Basin. The remedy also includes a complete remedy for protection of human health upstream of the Upriver Dam on the Spokane River and a complete remedy for protection of the environment between the Idaho/Washington border and Upriver Dam. For protection of the environment in areas of the Basin upstream of Coeur d'Alene Lake, the remedy identifies approximately 30 years of prioritized actions. During this period, the USEPA will evaluate the effectiveness and protectiveness of these remedial actions, as well as the technical practicability of attaining ARARs. During the five-year review process and

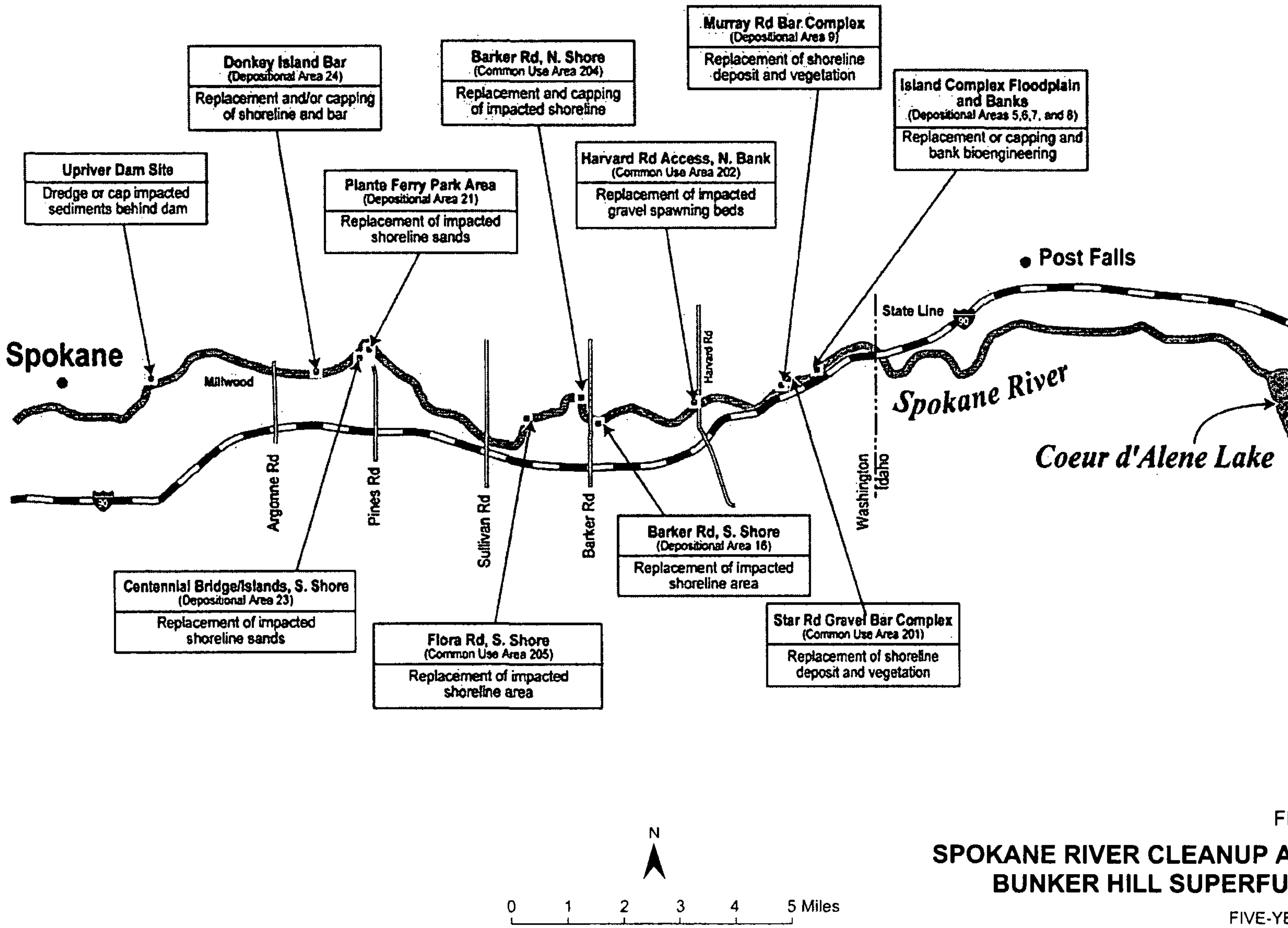



FIGURE 5-5

**SPOKANE RIVER CLEANUP ACTIONS**
**BUNKER HILL SUPERFUND SITE**

FIVE-YEAR REVIEW

at the end of the approximately 30-year period, the USEPA will evaluate and decide whether any additional CERCLA remedial actions are necessary to attain ARARs or to provide for the protection of human health and the environment, and whether any ARAR waivers should be applied.

Consistent with the National Oil and Hazardous Substances Contingency Plan (NCP)[1], the remedial actions selected in the 2002 OU3 ROD are an interim measure and will neither be inconsistent with, nor preclude implementation of, the final remedy that will be identified in subsequent decision documents. Section 13 of the 2002 OU3 ROD (Statutory Determinations) describes the federal and state ARARs that the remedy will attain. This section also describes other available information that does not constitute an ARAR (e.g., advisories, criteria, and guidance that are useful in selecting, designing, and implementing the remedy).

The remedial actions selected in the 2002 OU3 ROD are not intended to fully address contamination within the Basin. Thus, achieving certain water quality criteria standards, such as state and federal water quality standards and criteria and maximum contaminant levels for drinking water, are outside the scope of the remedial action selected in the 2002 OU3 ROD and are not applicable or relevant at this time. The water quality ARARs apply to point source discharges to surface water created as a result of implementation of the remedy (e.g., discharge from a water treatment facility). Similarly, maximum contaminant levels are applicable or relevant and appropriate at residences where an alternate drinking water supply is provided or drinking water is treated.

For this first five-year review of the OU3 remedy, the USEPA reviewed the federal, state, and tribal requirements that are applicable or relevant and appropriate to the scope of the remedial action. These requirements are included in the 2002 OU3 ROD (Section 13.2 - Compliance with Applicable or Relevant and Appropriate Requirements). Based on a review of ARARs, guidance, and other non-promulgated materials to be considered, the USEPA determined that all ARARs and To Be Considered (TBCs) noted in the 2002 OU3 ROD are accurate with the exception of the following changes since issuance of the 2002 OU3 ROD:

**Idaho Water Quality Standards and Wastewater Treatment Requirements, 58.01.02.284.** New aquatic life criteria for cadmium, lead, and zinc were established in March 2002. The regulation applies to the South Fork Coeur d'Alene River subbasin.[2] In addition, the criteria for concentration apply to all surface water within the subbasin except for natural lakes.

The ARARs identified in the 2002 OU3 ROD, and the above noted change, continue to be protective. The USEPA recognizes that other requirements are under development but not yet finalized (e.g., Coeur d'Alene Tribal water quality standards). At such time that other potential standards become final, the USEPA will evaluate their applicability to the Site.

[1] 40 CFR 300.430(a)(i)(B) and 40 CFR 300.430(f)(1)(ii)(C)(1)

[2] Hydrological Unit Code (HUC) 17010302

# 5.3 OU3-Wide Considerations

## 5.3.1 Institutional Controls in the Basin

The 2002 OU3 ROD requires an ICP similar to the ICP being used for OU1 and OU2 that will provide a means to protect remedial actions installed as part of the remedy. At this time, an OU3 ICP has not yet been established. The human health remedial actions proposed for OU3 are similar to the actions implemented in OU1 and OU2 in that the remedies involve partial removal of contaminated materials and identify the need for long-term actions to ensure that protective barriers are maintained over time. Therefore, it is anticipated that the existing ICP for OU1 and OU2 will be used as the model for the Basin. The OU1 and OU2 ICP includes records maintenance, permitting, surveillance, inspections, and local construction regulations developed and implemented in conjunction with local zoning, building, or planning commissions.

Institutional controls will be required in the Basin to ensure barriers remain protective, and that future development and remedial actions limit exposures to contaminated soil left in place and groundwater that was not addressed by the remedy. About 500 residential properties have been remediated in OU3 from 1997 to the present. It is important to establish an ICP as soon as possible to protect barriers from disturbance and minimize recontamination. In the meantime, property owners are provided information after their property has been remediated to help them manage their barriers so that they remain protective.

The development of an OU3 ICP will need to be coordinated with local governments and other entities in the Basin. Three local city governments have written letters to PHD requesting an ICP. Issues related to establishing an OU3 ICP are discussed in an IDEQ memorandum entitled *Establishing a Basin-wide Institutional Controls Program (ICP)* (TerraGraphics, 2005b). Several steps will be necessary to adopt an OU3 ICP, such as:

1. Clearly defining responsibilities and roles of entities that approve an ICP. This will require determinations regarding legal definitions of work activities, subordination of authorities, commitments to long-term funding, and inter-agency agreements;

2. Agreeing to and implementing a waste management strategy that meets the needs of the ICP. Disposal represents the greatest cost and engineering challenge for the ICP. Rules for waste management should be formalized through a memorandum of agreement (MOA) or some other formal means. To provide consistency, certainty, and equity for users and property owners, the rules should be applied uniformly and not be changed without formal modification procedures. The strategy should provide for convenient disposal areas at no cost to local residents and include estimates of anticipated waste flow (e.g., volume of waste generated from local development projects). Overall costs for OU3 ICP disposal are likely to exceed those for OU1/OU2 due to the need to serve residents across a larger geographic area;

3. Working with local communities to adopt companion ordinances. Resolutions, ordinances, and rules will need to be developed or modified to extend the OU1/OU2 ICP to the Basin. Some actions by city and county governments will also be required;

4. Developing a comprehensive and long-term funding strategy. In the Box, the PRPs have funded the majority of ICP costs. A similar agreement does not currently exist for OU3. As part of the OU3 ICP development process, a cost analysis should be completed to determine the annual and long-term funding needs for the OU3 ICP. A needs assessment that includes recommendations for long-term funding should be developed;

5. Establishing ICP boundaries. The OU1/OU2 ICP, which has been in place for the last 10 years, may expand to include OU3. An expansion of the OU1 and OU2 jurisdictional boundaries to OU3 would need to occur, and the extent of the OU3 boundaries will need to be defined;

6. Developing the OU3 ICP database. Both the database and the property disclosure program would need to be extended to encompass the boundaries determined for the OU3 ICP. Disclosure refers to providing property sampling information to individuals involved in local real estate transactions. The PHD currently provides property sampling information to individuals who contact them about local real estate transactions. The PHD responded to 222 disclosure requests in 2004; and

7. Developing an infrastructure plan. Maintaining and improving local infrastructure will be as important in the Basin as it has been in OU1/OU2. A plan would be developed to identify potential funding sources and other resources to implement infrastructure maintenance and improvements to protect the remedy. Infrastructure issues in the local communities are discussed in an IDEQ memorandum entitled *The Role of Community Infrastructure in the Cleanup of the Bunker Hill Superfund Site* (TerraGraphics, 2005a).

### *Remedy Issues*

**Table 5-1. Summary of OU3 ICP Issues**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **Institutional Controls Program:** An OU3 ICP has not yet been established and remedial actions are being implemented. | Y | Y |

### *Recommendations*

**Table 5-2. Summary of OU3 ICP Recommendations**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Institutional Controls Program:** Establish an OU3 ICP as soon as possible to protect barriers from disturbance and minimize recontamination | IDEQ, PHD, USEPA | USEPA | 12/2006 | Y | Y |

### 5.3.2 Health and Safety Review

Health and safety is an important component of implementation of the remedy. Protection of the health and safety of workers and the public is planned and managed during remedial activities. Health and safety (H&S) plans are required for all construction work funded by the USEPA and the State of Idaho. The H&S plan is consistent with requirements of the OSHA Hazardous Waste Site Regulations.[3] The H&S plan is prepared by the contractor(s) hired to perform the work and then submitted to the agency overseeing the work effort. Contractors are responsible for H&S for their projects, including the work of their subcontractors. Components of a typical H&S plan may include:

- Site Description and Contaminant Characterization;
- Safety and Hazard Assessment and Risk Analysis;
- Accident Prevention;
- Health and Safety Training;
- Medical Surveillance;
- Personal Protective Equipment;
- Monitoring, including air, noise, heat stress, and confined space;
- Safety and Work Practices;
- Site Control Measures;
- Personnel and Equipment Decontamination;
- Logs, Reports, and Recordkeeping;
- Emergency Response Plan and Contingency Procedures; and
- Spill Containment Plan.

Each contract employee is required to be familiar with the H&S plan and is required to have the necessary OSHA HAZWOPER 40-hour training and 8-hour annual refresher training. Daily tailgate meetings to plan the day and discuss activity-specific health and safety issues are held with work crews.

The goal of the H&S program is "zero incidents." During implementation of the human health remedy, there have been some incidents but no fatalities. Incidents that have occurred have been limited to less significant, yet still potentially serious, types of occurrences including:

- Vehicle accidents;
- Insect bites (e.g., spider);
- Slips, trips, and falls; and
- Muscle strains during lifting and bending.

Pursuit of the zero incident goal will continue with active planning and management of remedial activities.

[3] 29 CFR 1910.129 and 29 CFR 1926.65

## 5.3.3 Operations and Maintenance Costs and Plans

### 5.3.3.1 Human Health Remedy

Since the human health remedy is still being implemented, a more comprehensive review of operation and maintenance (O&M) costs will not be presented until the next five-year review. However, similar to OU1 and OU2, an ICP is being developed to ensure the long-term effectiveness of the human health remedy. In addition, it is likely that the PHD will manage the ICP, as they do in OU1 and OU2. The costs for managing the OU1 and OU2 ICP are described in Section 3.2.1.5. The costs for managing the OU3 ICP, including ICP disposal locations, likely will be higher than OU1/OU2 due to the number of communities located across a larger geographic area.

### 5.3.3.2 Ecological Remedy

The estimated net present worth of 30 years of environmental O&M costs is $40 million. Table 12.2 of the 2002 OU3 ROD provides estimated O&M costs for each of the ecological cleanups (USEPA, 2002a). It is premature to review these O&M costs at this time as ecological remedies have not yet been implemented. Treatability studies and engineering evaluations/cost analysis (EE/CAs) are still underway, and remedial designs (RDs) have only just begun. As ecological remedies are implemented over the next 30 years, the USEPA will evaluate the protectiveness and effectiveness of each cleanup action, and minimize future O&M costs.

Preparing O&M plans and conducting long-term O&M for PRP-led ecological cleanup actions are the responsibility of the PRPs via an administrative order on consent (AOC) and/or a consent decree (CD). The State of Idaho has assured via the OU3 State Superfund Contract (SSC) (USEPA and IDEQ, 2003) that it will take on responsibility for long-term O&M of implemented federal government-financed cleanups.

# 5.4 Status of Removal Actions

This section discusses several of the major removal actions and pilot projects that were initiated in OU3 prior to the release of the 2002 OU3 ROD. These actions either have ongoing evaluations or issues and follow-up recommendations that have been identified. Table 5-16 provides a summary of all the removal actions and pilot studies initiated in OU3 prior to the 2002 OU3 ROD. A separate discussion of the removal action to address the Union Pacific Railroad (UPRR) Wallace-Mullan right-of-way (ROW) (Trail of the Coeur d'Alenes) is in Section 5.8 of this report.

Most removal actions conducted in OU3 were implemented to address human health exposures. Some of the removals and pilot projects also addressed ecological risks. As shown in Table 5-16, the OU3 removal actions and pilot projects were implemented by a number of different agencies, including the USEPA, the IDEQ, the BLM, the USFS, the Coeur d'Alene Tribe, and the Silver Valley Natural Resource Trustees (SVNRT). Various funding sources were used; however, all of the removal actions and pilot projects were conducted pursuant to CERCLA. For example, the SVNRT was formed following the Natural Resources Damage Assessment (NRDA) Settlement reached between the State of Idaho and some of the area mining companies. The SVNRT used settlement funds for several OU3 removal projects and CERCLA action memoranda were completed for each removal project. Although not specifically discussed in this section, it is recommended that all the SVNRT and other pre-OU3 ROD removal actions and pilot projects be evaluated in context of the 2002 OU3 ROD to ascertain if these actions are complete or if they warrant further action.

## 5.4.1 Residential and Common-use Areas

### 5.4.1.1 Review of Action Memo Requirements

The USEPA conducted time-critical removal actions (TCRAs) in OU3 residential and common-use areas from 1997 to 2001. In 2002, the IDEQ conducted TCRAs in the OU3 residential areas. The TCRAs were implemented under the authority of Special Circumstances Action Memoranda and Decision Memoranda (USEPA, 1997; 1998a; 1998c; 1999b; 2000d; 2001a; and 2002b). The following actions were included in the scope of work:

- Partial excavation of lead-contaminated soils and replacement with clean backfill material for residential yards and common-use areas (including recreational areas);
- Provision of an alternate water supply for residences on contaminated private drinking water wells, such as connection to a nearby community water supply or end-of-tap water filters;
- Siting, design, and construction of a mine waste repository for disposal of contaminated materials generated from the ongoing response actions. For more information on the mine waste repository (the Big Creek Repository), see Section 5.5.6.3 of this report; and
- Access restrictions where humans have uncontrolled access to mine and mill sites.

### 5.4.1.2 Background and Description of Residential and Common-use Removal Actions

The strategy for OU3 residential and common-use removal actions was consistent with actions taken in OU1 and OU2 from 1989 through 2002, where intervention and soil cleanup actions contributed to a 75 percent decline in average blood lead levels among Kellogg children (from 10.8 to 2.6 micrograms per deciliter [μg/dL]). Actions were first targeted at homes where pregnant women reside and where families have children 6 years of age and under. Schools, day care facilities, and other common areas typically used by children also were in the first tier of response. Basin removal actions included both soil removals and provision of drinking water to homes on contaminated private wells.

From 1997 through 2002, the USEPA and the IDEQ completed soil removal actions at 119 residential yards and 7 schools and daycares. The USEPA also completed removal actions at common-use areas during this same time (e.g., recreational areas). These removal actions are described individually in the following sections.

Similar to remedial actions conducted in OU1 and OU2, the property owners are responsible for maintenance after the cleanup is completed. Specifically, the property owner is required to maintain the protective barriers on their property over time (e.g., ensure that sod is properly watered). Drinking water treatment, municipal water hookup, or bottled water was provided to approximately 28 residences.

As previously noted, during the 2002 construction season, the IDEQ conducted TCRAs in the OU3 residential areas. The scope of work for the pilot program was consistent with the OU3 residential removal actions conducted by the USEPA. The IDEQ referred to the removal actions as the 2002 Yard Enhancement Selection (YES) pilot project and funded the actions with State of Idaho funding. The USEPA authorized the removal actions through a Decision Memorandum (USEPA, 2002b). The IDEQ completed cleanup of 28 residential properties in 2002 (IDEQ, 2002). Also in 2002, the USEPA completed two residential and common-use cleanup actions that had been started in 2001 but were delayed due to inclement weather or coordination with property owner schedules.

A summary of the OU3 residential and common-use removal actions is presented in Table 5-16.

#### 5.4.1.3 Technical Assessment of Residential and Common-use Removal Actions

Per USEPA guidance (USEPA, 2001e), technical assessments of the Residential and Common-use removal actions were conducted by evaluating the following three questions related to protectiveness of the implemented actions:

##### *Question A: Is the remedy functioning as intended by the decision documents?*

The removal actions in the residential and common-use areas were constructed in accordance with the requirements of the action memos and decision memoranda. Similar actions were selected in the OU3 ROD human health remedy to address contaminated residential properties and identified recreational areas in the Upper and Lower Basin. The remedy is expected to be protective when it is completed and maintained.

##### *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?*

The exposure assumptions, toxicity data, and cleanup objectives remain valid. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

##### *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

At this time, an ICP has not been adopted in OU3. The ICP will help maintain long-term protectiveness of the remedy, including efforts to ensure that property owners are adequately maintaining the protective barriers installed during the removal actions. This issue is discussed in more detail in Section 5.3.1 of this report.

##### *Remedy Issues*

The issues for residential removals are similar to residential remedial actions. See Section 5.5.1 of this report for issues related to residential cleanup actions.

##### *Recommendations*

The recommendations and follow-up actions for residential removals are similar to residential remedial actions. See Section 5.5.1 of this report for recommendations related to residential cleanup actions.

## 5.4.2 Gem Portal Pilot

### 5.4.2.1 Background and Description of Pilot Project

The Gem Portal drains groundwater from the historic Helena-Frisco and Black Bear Mines near Canyon Creek. The flow from the portal is reported to vary seasonally from 100 up to 600 gallons per minute (gpm), averaging 230 gpm. Zinc is the principal chemical of concern and typically is found in concentrations ranging from 6.59 to 14 milligrams per liter (mg/L) (total recoverable) in the inflow. The mean zinc concentration is 10.138 mg/L. The mean laboratory pH is 7.1 units. The pH range is 6.59 to 8 (MFG, 2004).

Under an AOC,[4] ASARCO conducted a test of a passive and a semi-passive pilot treatment system to treat the discharge from the Gem Portal. Construction of the pilot system was substantially completed during 2000. Portal water is piped 6,200 feet from the portal to the pilot system in an 8-inch-diameter pipe. A portion (10-20 gpm) of the discharge is separated out and makes up the influent to the pilot system. The influent flows into a pre-treatment oxidation/settling pond where iron is precipitated and removed. The inflow is then split in half, with half flowing through a sand filter into Cell T-1 and half flowing through a second sand filter into Cell T-2. The sand filters remove sediments prior to the treatment cells.

Cell T-1 is a low-permeability compost bioreactor that is designed to passively remove metals. The substrate is sawdust (37.5 percent), manure (10 percent), alfalfa (2.5 percent), and gravel (50 percent). Sulfate-reducing bacteria in the substrate convert the sulfate in the influent to sulfide. The sulfide then forms low-solubility metal complexes (with zinc, cadmium, etc.) that precipitate from the water. Metal concentrations therefore are reduced prior to discharge from the cell. Mine water was first added to T-1 in January 2001.

Cell T-2 is a high-permeability gravel bioreactor. The substrate is comprised of clean gravel. The cover is a compacted silt layer to minimize oxygen transfer. A soluble organic carbon (an alcohol mixture) is fed into the T-2 influent at a rate of 1 milliliter per minute (mL/minute). The organic carbon sustains the sulfate-reducing bacteria and allows the same chemical process found in T-1 to occur. Organic carbon was first added to T-2 in April 2001.

The treated effluent from the two pilot cells co-mingles and discharges to Canyon Creek.

In addition to the two pilot cells, ASARCO also completed a study of the Vandal_ION ™ process for iron and zinc removal. The technology is a co-precipitation and adsorption process whereby the metals are adsorbed onto iron-oxide-coated sand. The sand is kept in motion in a moving bed reactor where the adsorbed metals are removed from the sand by abrasion, separated in a clarifier, and properly disposed. The objectives of the test were threefold:

1. Test the moving bed filter for iron removal;
2. Test the active filtration, Vandal_ION ™ process for iron removal using various reagents or oxidation steps; and
3. Test the active filtration, Vandal_ION TM process for removal of zinc.

[4] Administrative Order on Consent; Gem Mine Portal, Canyon Creek; United States Environmental Protection Agency v. ASARCO; EPA Docket No. 10-97-0172; September 30. 1997.

In September 2004, Asarco submitted a draft EE/CA for the Gem Portal Pilot Study. A summary of the pilot test data showed:

- Each step in the pilot treatment process resulted in reduction of zinc, lead and cadmium;
- In general, the semi-passive system treatment cell T-2 (sand substrate with addition of methanol) performed better than the passive system treatment cell T-1 (substrate of organic matter, compost, manure, and alfalfa);
- Performance seemed to be affected by flow conditions and by physical plugging and blocking of flow in the cells; and
- Removal of zinc and other metal coincided with mobilization of iron and to a lesser degree other metals, including arsenic, suggesting the removal of zinc is not a result of the formation of sulfide minerals in anaerobic conditions but is more likely the result of the chemical and physical adsorption by organic/metal complexes.

Five general remedial action alternatives were evaluated for the Gem Portal drainage discharge. The alternatives are no action, passive biological treatment, semi-passive biological treatment, conventional lime precipitation treatment, and high-density sludge treatment. Based upon the information provided in the draft EE/CA, several actions are recommended. These include:

- A site-specific bench-scale treatability test to provide information on the performance and technical details associated with passive aerobic treatment; and
- Additional site-specific bench-scale testing of conventional treatment using lime and caustic. This test would provide additional information on performance, quantities of sludge, and settling rates, and refined estimates of costs.

#### 5.4.2.2 Technical Assessment of Gem Portal Pilot

Per USEPA guidance (USEPA, 2001e), technical assessment of the Gem Portal Pilot Project was conducted by evaluating the following three questions related to protectiveness of the implemented actions:

***Question A: Is the remedy functioning as intended by the decision documents?***

Although the pilot test is complete, the passive pilot treatment system continues to operate along with a scaled-back monitoring program for ongoing pilot plant operation. While the various active and passive treatment technologies tested showed significant reductions in zinc loadings, no final treatment technology for the Gem Portal discharge has been selected. Additional testing programs are being considered to further evaluate treatment technologies since a full-scale treatment system for the Gem Portal discharge is not fully mitigated and is not fully protective of the environment.

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the Gem Portal Pilot project. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

This five-year review did not find any new information that calls into question the protectiveness of the Gem Portal Pilot Project.

***Remedy Issues***

**Table 5-3. Summary of Gem Portal Remedy Issues**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current | Future |
| **Long-term Treatment System:** Need to evaluate the Gem Portal Project in the context of the OU3 ROD and in light of other water treatment work planned for Canyon Creek and other inputs into Canyon Creek. The Gem Portal Pilot Project is on BLM land and the BLM is not supportive of this location for a final long-term treatment system. | Y | Y |

***Recommendations***

**Table 5-4. Summary of Gem Portal Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current | Future |
| **Long-term Treatment System**: Continue to evaluate pilot treatment system in context of Canyon Creek remedy.<br><br>(The USEPA is currently evaluating the draft EE/CA findings and is developing a strategy for moving forward that is consistent with the other work being done to evaluate surface and groundwater treatment options in Canyon Creek [see Section 5.5.3.1]). | BLM, USEPA | USEPA | Ongoing | Y | Y |

## 5.4.3 Success Mine Pilot

### 5.4.3.1 Background and Description of Removal Actions

The Success Mine and Mill Site (Success Site) is located on East Fork Ninemile Creek, which drains into Ninemile Creek, a tributary to the SFCDR. The mine and mill have not been operated for decades, but environmental impacts from the past operation continue. The primary contaminant source at the site is a 200,000- to 350,000-cubic-yard mine and mill waste pile (Golder Associates, 2003). The pile is concentrated in a 10-acre tract in the bottom of a narrow, steep-sided canyon. The Success Site is located within the Coeur d'Alene mining district, approximately 5 miles northeast of the town of Wallace.

The Success Site has been identified as a significant contributor to metals loading into the SFCDR from the Ninemile Creek Watershed. Of the total loading to the SFCDR from the Ninemile Creek drainage, approximately 37 percent of total lead, cadmium, and zinc under high flow, and 87 percent at base flow, can be traced to the Success Site (Golder Associates, 2003). Due to the location of the mine wastes within the drainage, a significant portion of the East Fork Ninemile alluvial aquifer flows through materials with metal concentrations. This results in large dissolved metals concentrations and loadings in the groundwater immediately downstream of the Success Site.

The USEPA relocated the East Fork Ninemile Creek in 1995 to eliminate direct surface contact with mine wastes; however, this alteration of the stream channel did little to reduce metal loading from the groundwater. To address this, the SVNRT organized a technical committee to focus on selection and completion of a non-time critical remedial response for the site. Golder Associates completed several reports that outlined the work done at this site (Golder Associates, 2000a; 2000b; 2000c; 2001a; 2001b; 2002a; 2002b; 2003).

Between 2000 and 2001, a pilot treatment system was designed and installed at the Success Site. The system consists of a subsurface grout wall to intercept groundwater that has been in contact with the mine wastes and direct it to a treatment cell. The treatment cell is a concrete vault that has been subdivided into a pre-filter of washed rock followed by a cell of Apatite WE™, a fishbone apatite mixture. The treated water is then discharged into East Fork Ninemile Creek. A complete description of the treatment system for the Success Site can be found in the as-built report (Golder Associates, 2002b). A chronology of actions undertaken since 2000 follows in Table 5-5 (adapted from Golder Associates, 2003).

**Table 5-5. Chronology of Activities at the Success Site**

| Activity | Date |
|---|---|
| Engineering Design/ Cost Assessment | April 2000 |
| Pre-Design Investigation | June 2000 |
| Design, Workplan, Bid Package and Contractor Selection | August 2000 |
| Phase 1 Work – Installation of the vault and 150 ft of grout wall | September 2000-February 2001 |
| Phase 2 Work – Installation of 650 ft of three hole array grout wall and an additional 650 ft of two hole array grout wall. Additional maintenance of the vault was also completed. | July-October 2001 |
| Effectiveness Monitoring (quarterly, with some parameters monitored monthly earlier in the project). | January 2001-June 2004 |

### 5.4.3.2 Technical Assessment of Success Mine Pilot Project

Per USEPA guidance (USEPA, 2001e), technical assessment of the Success Mine Pilot Project was conducted by evaluating the following three questions related to protectiveness of the implemented actions:

### *Question A: Is the remedy functioning as intended by the decision documents?*

A review of available reports on the Success Mine Pilot Project indicates several key findings related to remedial effectiveness of the project:

- Groundwater monitoring results taken above and below the treatment cell indicate that the apatite treatment cell removes in excess of 90 percent of total lead, cadmium, and zinc from water;
- The ratio of total to dissolved zinc changes after treatment. After treatment, a larger proportion of the remaining zinc is in particulate form;
- Based on sample results and estimated flow through the treatment cell, 30 pounds of total cadmium, 65 pounds of total lead, and 4,900 pounds of total zinc were removed in the 26 months from March 2001 to May 2003;
- Monitoring data indicate that dissolved sulfate, dissolved manganese, and total fluoride are reduced by apatite treatment;
- Flow through the cells decreases over time. The quantity of water treated decreased by up to 90 percent through the time period that the cell was monitored. Originally the cell treated 32 gpm. By June of 2003 the cell was treating 3.3 gpm. The reduction in flow capacity is likely a result of clogging of the inflow pipes or reduced hydraulic conductivity of the apatite;
- Treated water has increased concentrations of dissolved calcium, dissolved magnesium, dissolved sodium and total chloride;
- Phosphorus concentrations discharged from the treatment cell are significantly higher than influent concentrations. Upstream levels are <0.01 mg/L, while effluent from the cell is typically 7 to 9 mg/L. This is down from the initial months of operation, when total phosphorus concentrations were in excess of 20 mg/L. Monitoring of East Fork Ninemile downstream of the treatment cell did not find an increase in total phosphorus concentration 2 kilometers downstream;
- Apatite treatment releases a significant amount of nitrogen into the treated water, primarily as ammonia. Levels in the cell outflow after several months of operation were between 25 and 30 mg/L ammonia. These levels decrease in the winter months as biological activity decreases. Levels in February were 16.0 mg/L in the east outlet and 0.92 mg/L in the west outlet. The ammonia levels are not detectable at the downstream monitoring station on East Fork Ninemile Creek;
- During the first few months after cell installation, outflow sampling indicated the presence of 16,000 MPN (most probable number) per 100 ml of the bacteria Enterococci. As the apatite aged, the bacteria levels dropped significantly. The last two sampling runs did not detect any Enterococci;
- Apatite treatment raised water pH from 4.5 and 5.5 at the inlets to 6.5 and 7.1 at the outlets;
- Attenuation of the metals can be attributed to a variety of mechanisms. Speciation modeling identified chloropyromorphite and otavite as possible controlling mineral

phases for aqueous lead and cadmium concentrations, respectively. However, precipitation of metal sulfides is also likely to be responsible for attenuation of lead, cadmium, and zinc. Although surface adsorption was not modeled, some attenuation is likely due to adsorption onto the surface of the Apatite II treatment medium (Golder Associates, 2003); and

- The treatment cell emitted a strong odor for the first few months of operation. This was most likely due to soft tissue decomposition associated with the fish bones. In an attempt to control the odor, activated charcoal in burlap bags and cedar shavings was added to the vault. It is unclear if treating with activated charcoal and cedar shavings was effective in controlling the odor. Prior to replacement of the apatite medium, it may be advisable to heat-treat the apatite to destroy any soft tissue.

### *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?*

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the implementation of the Success Site Pilot Project See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

### *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

Additional monitoring efforts are currently being conducted by the Idaho National Engineering and Environmental Laboratory (INEEL). In addition to water chemistry sampling, INEEL is conducting tracer studies to determine the prevalent groundwater pathways at the Success Site, and are attempting to determine the effect of the barrier wall on stream chemistry (INEEL, 2004). INEEL is also investigating several methods to remedy the reduction in flow over time. In November of 2004, INEEL injected barium chloride (BaCl) into the groundwater 400 feet upgradient from the treatment vault. The BaCl is intended to increase the conductivity of the groundwater to allow investigators to track groundwater migration. Although the tracer was not detected in the downgradient monitoring wells, without subsequent well pumping, the tracer was detected at the outlet of the apatite vault and from a seep downgradient of the apatite barrier three days later. Tracer was not detected in the stream, but the non-detection may have been due to dilution or other factors and may not reflect grout wall performance. Water chemistry data collected by INEEL in early November of 2004 indicates that although the treatment cell is able to effectively remove contaminants, the large decrease in cell flow-through water resulted in correspondingly reduced volume of removed contaminants. Effluent levels of total lead, cadmium, and zinc are below detection levels of 0.005, 0.002, and 0.005, respectively. This is a 99 percent reduction from influent values. Ortho phosphorus and ammonia levels remain elevated at 9.1 mg/L and 11.0 mg/L, respectively.

### Remedy Issues

Table 5-6. Summary of Success Mine Pilot Remedy Issues

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| None | – | – |

### Recommendations

Table 5-7. Summary of Success Mine Pilot Recommendations and Follow-Up Actions

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Incorporate Results:** Continue to monitor results of the pilot study and incorporate the information into the ongoing Canyon Creek water quality treatability studies and design work. | IDEQ, USEPA | IDEQ, USEPA | 12/2009 | N | Y |

## 5.4.4 Black Rock Slough Trailhead/Highway 3 Crossing

### 5.4.4.1 Review of Requirements

A TCRA was begun in 2001 and completed in 2002 at the Highway 3 Overpass site by the USACE on behalf of the USEPA in 2002 (USEPA, 2003a and 2003b). The removal action was authorized pursuant to a Decision Memorandum dated November 18, 1998. In addition, a Special Circumstances Action Memorandum to continue removal actions at common-use areas and other areas was issued on June 26, 2000.

### 5.4.4.2 Background and Description of Removal Action

The site is owned by Idaho Department of Fish and Game (IDFG) and is located approximately 4 miles south of Rose Lake adjacent to State Highway 3 at the bridge across the Coeur d'Alene River (USEPA, 2003b). The recently opened Trail of the Coeur d'Alenes passes within 100 yards of this location. The site is on the outside of a meander bend with active bank erosion. The area southwest of the site is used for recreational activities. The river's water elevation can fluctuate up to 10 feet on a seasonal basis. Sediment and surface soil in the area are highly contaminated with heavy metals. This site, also known as Highway 3/Trail of the Coeur d'Alenes Crossing, was the subject of a subsequent remedial action conducted in 2004 under the 2002 OU3 ROD (see Section 5.5.1.11 of this report).

In 2001, a removal action at the site included grading and capping the access road, a parking area, and a trail that provides access from the parking area to the Trail of the Coeur d'Alenes project (USEPA, 2003b). The grading was conducted with a net-zero cut-and-fill balance to reduce the quantity of contaminated soils requiring disposal at an offsite repository. Additional activities included installation of site access controls and stabilization of 125 feet of eroded riverbank adjacent to the access trail along the Coeur d'Alene River using vegetated geotextile-reinforcement. The geotextile-reinforced embankment section was placed on a quarry spall base and tied into the existing bank in a manner intended to prevent scour and erosion. Additional bank maintenance (e.g., removal of cottonwood trees near the bank edge, etc.) was conducted to prevent or minimize erosion and improve bank stability. Completion of this removal action was delayed until 2002 due to poor weather conditions.

During the winter of 2001 and spring of 2002, the valley flooded and the floodwaters extended to the bottom toe of the access road to the site from Highway 3 (USEPA, 2003a). The flooding caused the following damage:

- Creation of an erosion channel on the west side of the geotextile-reinforced embankment section;
- Settlement/consolidation of the reinforced embankment section as evidenced by minor cracking along the interface between the original bank surface and the reinforced area;
- Mud deposition on the paved area; and
- Bank erosion along a 100-foot section east of the geotextile-reinforced section.

In 2002, the following activities were conducted to complete removal actions at the Highway 3 bridge site as well as minor repairs and cleaning associated with the high water event (USEPA, 2003a):

- Complete unfinished activities (e.g., complete parking lot striping, set parking curbs, establish site drainage, and conduct hydroseeding of adjacent area);
- Repair features damaged by the winter/spring flood event; and
- Install engineering controls to prevent future damage.

Additional RA work was performed at this site in 2004 under the 2002 OU3 ROD to limit human exposure to contaminated soils adjacent to the parking lot constructed under the prior TCRA. For details about this cleanup work, please see Section 5.5.1.11 of this document.

#### 5.4.4.3 Technical Assessment of Removal Action

Per USEPA guidance (USEPA, 2001e), technical assessment of the Black Rock Slough Trailhead/Highway 3 Crossing removal action was conducted by evaluating the following three questions related to protectiveness of the implemented action:

***Question A: Is the remedy functioning as intended by the decision documents?***

The remedy is functioning as intended and has proven to be effective, with only minor damage from the flooding event in winter 2001 and spring 2002. No other high water events, however, have occurred since this earlier event. The vegetation of the geotextile-reinforced embankment section is establishing well, and the embankment will be monitored periodically to assess for integrity and continued vegetative growth.

The site was the subject of additional cleanup work in the 2004 RA conducted under the 2002 OU3 ROD (see Section 5.5.1.11 of this report). The lower portion of the vegetated geotextile-reinforced embankment will be monitored as there is some evidence that erosion of the lower portion may be occurring.

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the Black Rock Slough Trailhead/Highway 3 removal action. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

This five-year review did not find any new information that calls into question the protectiveness of the Black Rock Slough Trailhead/ Highway 3 removal action.

***Remedy Issues***

**Table 5-8. Summary of Black Rock Slough Trailhead/ Highway 3 Remedy Issues**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| None | -- | – |

***Recommendations***

**Table 5-9. Summary of Black Rock Slough Trailhead/ Highway 3 Crossing Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Continue Monitoring**: Remedy is functioning as intended; continue to monitor streambank stabilization. | USEPA | USEPA | Ongoing | N | Y |

## 5.4.5 Medimont and Rainy Hill Boat Launches

### 5.4.5.1 Review of Authority and Requirements

Both the Medimont and Rainy Hill Boat Launches are owned by the USFS. The USEPA's CERCLA funds cannot be used at sites on federal land managed by the USFS or other federal property owners. Accordingly, the USFS used their CERCLA authority to conduct the removal actions at both boat launches. This removal action decision is documented in an Action Memo.

#### 5.4.5.2 Background and Description of Removal Actions

In 1999, the USFS (with $10,000 contributions from ASARCO and Hecla) placed approximately 1,000 cy of clean 1-inch minus aggregate on the parking and access areas of both the USFS Rainy Hill and Medimont Boat Launches. This clean material was placed to cover contaminated sediments in these areas that are part of the floodplain. Larger 3- to 6-inch rock was placed on the beach areas at Rainy Hill to discourage children from playing in the shallow water. Boulders were also placed to control traffic routes.

#### 5.4.5.3 Technical Assessment of Removal Actions

Per USEPA guidance (USEPA, 2001e), technical assessments of the Medimont and Rainy Hill Boat Launches removal actions were conducted by evaluating the following three questions related to protectiveness of the implemented actions.

***Question A: Is the remedy functioning as intended by the decision documents?***

Gradual recontamination of both sites has occurred over the past 5 years due to flooding and high spring flow. As recommended by the Basin Commission's Recreational Area Project Focus Team (PFT) and the TLG , the Coeur d'Alene Basin Five-Year Plan (Basin Commission, 2003b) included the following additional actions for the two USFS boat launches:

- Medimont Boat Launch
  - Recommend that USFS consider paving existing boat launch area and establish paved picnic site near restrooms on north side of site
  - Continue day-use only limitation
  - Bank stabilization issues need to be addressed
  - Consider establishment of overnight RV parking area (similar to the BLM's Killarney Lake Recreational Area)
- Rainy Hill Boat Launch
  - Recommend that USFS consider paving existing boat launch area and establish paved picnic site near restrooms on north side of site
  - Continue day use only limitation

The USFS has secured funding to cap via pavement the parking areas of the Rainy Hill Boat Launch, which is the more flood-prone of the two sites. This work is expected to be completed in 2006.

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the USFS Rainy Hill and Medimont Boat Launch removal actions. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

Beyond the discussion noted above in response to Question A, this five-year review did not find any new information that calls into question the protectiveness of USFS Rainy Hill and Medimont Boat Launch removal actions.

### *Remedy Issues*

**Table 5-10. Summary of Medimont and Rainy Hill Boat Launches Remedy Issues**

| Issues | Affects Protectiveness (Y/N) Current (now to 1 year) | Affects Protectiveness (Y/N) Future (>1 year) |
|---|---|---|
| **Recontamination:** Gradual recontamination of surface soil at both sites has occurred over the past 5 years due to flooding and high spring flow. | N | Y |

### *Recommendations*

**Table 5-11. Summary of Medimont and Rainy Hill Boat Launches Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) Current (now to 1 year) | Follow-up Actions: Affects Protectiveness (Y/N) Future (>1 year) |
|---|---|---|---|---|---|
| **Medimont:** Recommend that USFS consider paving existing boat launch area and establish paved picnic site near restrooms on north side of site. Continue day use only limitation. Address bank stabilization issues. Consider establishment of overnight RV parking area.<br><br>**Rainy Hill:** Due to gradual recontamination from flooding and high spring flows, USFS plans to cap with asphalt. | USFS | USFS | TBD, pending funding | N | Y |

## 5.4.6 Thompson Lake Boat Ramp

### 5.4.6.1 Review of Requirements

A time-critical removal action was completed at the Thompson Lake Boat Ramp by the USACE on behalf of the USEPA. The removal action was authorized pursuant to a Special Circumstances Action Memorandum (USEPA, 1998c) and a Decision Memorandum (USEPA, 1998b).

#### 5.4.6.2 Background and Description of Removal Action

The Thompson Lake Boat Ramp is a recreational facility owned by the IDFG. Surface sediment at the facility had an average lead concentration of 3,540 mg/kg. The Thompson Lake facility consisted of an unpaved vehicle parking area and a dilapidated boat ramp, which provided access to the Coeur d'Alene River and shoreline for recreational activities such as boating, fishing, and swimming. The surrounding shoreline was sparsely vegetated, with the exception of the immediate vicinity of the boat ramp. The shoreline near the site was generally devoid of vegetation, thus exposing recreational users to the contaminated sediments found throughout the river system and exposing the sediments to continual erosion, dissolution, and resuspension downstream.

Construction started on October 18, 1999. Sediments were excavated from the shoreline of the Coeur d'Alene River approximately 10 feet inland and 5 feet to groundwater. Geotextile fabric was placed against the face of the bank, against which 12-inch riprap was placed throughout the excavation and extending several feet into the river. Concrete planks were installed from the bank into the river to provide a boat launch. Work started on rebuilding an existing, unpaved parking lot. However, due to rainfall and inclement weather that limited the construction season, the removal action was completed in 2000.

#### 5.4.6.3 Technical Assessment of Removal Action

Per USEPA guidance (USEPA, 2001e), technical assessment of the Thompson Lake Boat Launch removal action was conducted by evaluating the following three questions related to protectiveness of the implemented action:

***Question A: Is the remedy functioning as intended by the decision documents?***

The Thompson Lake Boat Launch removal action is functioning as intended by the decision documents. Specific aspects of the remedy performance evaluation are described below.

In accordance with Commission's five-year plan, the Basin Commission's Lower Basin Recreational Area PFT conducted a site visit to the Thompson Lake Boat Launch in March 2004 to determine if additional cleanup work is required at this site (Basin Commission, 2003b). Based upon this recent review of the status and condition of the Thompson Lake Boat Launch, the Recreational Area PFT determined that the site remedy is functioning as intended and that no additional action is warranted at this time.

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the Thompson Lake Boat Launch removal action.

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

This five-year review did not find any new information that calls into question the protectiveness of the Thompson Lake Boat Launch removal action.

### *Remedy Issues*

**Table 5-12. Summary of Thompson Lake Boat Launch Issues**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current | Future |
| None | — | — |

### *Recommendations*

**Table 5-13. Summary of Thompson Lake Boat Launch Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current | Future |
| None | — | — | — | — | — |

## 5.4.7 Anderson Lake Boat Launch

### 5.4.7.1 Review of Requirements

A TCRA was completed at the Anderson Lake Boat Launch by the USACE on behalf of the USEPA in 1999. The removal action was authorized pursuant to a Special Circumstances Action Memorandum (USEPA, 1998c) and a Decision Memorandum (USEPA, 1998b).

### 5.4.7.2 Background and Description of Removal Action

The Anderson Lake Boat Ramp is a recreational facility owned by the IDFG and is located immediately east of the Highway 97 bridge across the Coeur d'Alene River. Surface sediment at the facility had an average lead concentration of 2,610 mg/kg. The Anderson Lake facility consisted of an unpaved vehicle parking area and undeveloped boat launch, which provided access to the Coeur d'Alene River and shoreline for recreational activities. The shoreline near the site was generally devoid of vegetation, thus exposing recreational users to the contaminated sediments found throughout the river system and exposing the sediments to continual erosion, dissolution, and resuspension downstream.

The removal action construction started on October 5, 1999, and was completed on October 29, 1999. Sediments were excavated from the shoreline of the Coeur d'Alene River approximately 10 feet inland and 5 feet to groundwater. Geotextile fabric was placed against the face of the bank, against which 12-inch riprap was placed throughout the excavation and extending several feet into the river. Concrete planks were installed from the bank into the river to provide a boat launch.

The existing, unpaved vehicle parking lot was rebuilt and overlain with asphalt. Access to the parking lot was improved by grading the adjacent unpaved roadway.

#### 5.4.7.3 Technical Assessment of Removal Action

Per USEPA guidance (USEPA, 2001e), technical assessment of the Anderson Lake Boat Launch removal action was conducted by evaluating the following three questions related to protectiveness of the implemented action:

***Question A: Is the remedy functioning as intended by the decision documents?***

The Anderson Lake Boat Launch removal action is functioning as designed and constructed. Specific aspects of the remedy performance evaluation are described below.

In accordance with Basin Commission's five-year plan, the Basin Commission's Lower Basin Recreational Area PFT conducted a site visit to the Anderson Lake Boat Launch in March 2004 to determine if additional cleanup work is required at this site (Basin Commission, 2003b). The PFT and this five-year review determined that the remedy is functioning as designed and constructed.

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the Anderson Lake removal action. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

While this five-year review did not find any new information that calls into question the protectiveness of the Anderson Lake Boat Launch removal action, the Idaho Highway 97 bridge across the Coeur d'Alene River is immediately downstream of the boat launch. The Idaho Transportation Department (ITD) is in the planning and design phase for replacement of this bridge. The new bridge will be considerably wider and bridge access will be adjusted accordingly, which may in turn impact the Anderson Lake Boat Launch access point. Accordingly, the USEPA is deferring any decisions regarding additional RA work at the Anderson Lake Boat Launch so that any additional cleanup efforts can be coordinated with the bridge replacement. The USEPA arranged a site visit by the Basin Commission's Recreational Area PFT in March 2004 with ITD representatives and will continue to stay abreast of ITD's plans to the extent that this activity may influence the Superfund remedy.

***Remedy Issues***

**Table 5-14. Summary of Anderson Lake Boat Launch Remedy Issues**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **Hwy 97 Bridge:** Keep abreast of Hwy 97 bridge replacement adjacent to boat launch. | N | To be determined pending completion of bridge replacement |

### *Recommendations*

**Table 5-15. Summary of Anderson Lake Boat Launch Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Hwy 97 Bridge**: The USEPA will continue to stay abreast of plans for Hwy 97 bridge replacement to the extent that this activity may influence the Superfund actions at IDFG's Anderson Lake facility. Pending completion of designs for the Highway 97 bridge replacement, the USEPA, the IDFG and the Recreational Area PFT will evaluate the potential need for additional cleanup work at this site. | USEPA | USEPA | Ongoing | N | N |

## 5.4.8 Summary of OU3 Removal Actions

Table 5-16 provides a summary of all the removal actions and pilot studies initiated in OU3 prior to the 2002 OU3 ROD.

| Table 5-16. Summary of Removal Actions – Operable Unit 3 | | | |
|---|---|---|---|
| **Site Name** | **Responsible Entity** | **Dates of Action** | **Description of Action** |
| **Residential and Common-use Areas** | | | |
| Residential Yards | IDEQ, USEPA | 1997-2002 | Partially removed lead-contaminated soils and replaced with clean soil barrier and or other protective barriers (e.g., clean gravel). From 1997-2002, actions were completed at 119 residential yards. |
| Schools/Daycares | USEPA | 1997-2001 | Partially removed lead-contaminated soils and replaced with clean soil or other protective barriers (e.g., clean gravel). Actions were completed at seven schools and daycares. The Silver Hills Middle School was started in 1997 and additional work was completed in 1998, 2001, and 2002 due to the extremely large property size. |
| Private Drinking Water | USEPA | 1997-2002 | Provided alternate water supply to 28 residences on contaminated private wells. Alternate supplies included bottled water for 11 homes, end-of-tap water treatment (water filters) for 5 homes, and municipal water hookup for 12 homes. |
| **Canyon Creek** | | | |
| Standard Mammoth Facility | ASARCO | 1997-1998 | Removal of tailings with disposal at Woodland Park Repository. Regraded, stabilized, capped, and revegetated waste rock pile. Removed railroad grade and crossing. |
| Canyon Creek from Tamarack to below Gem | SVNRT | 1997-1998 | Time-critical removal of ~127,000 cubic yards (cy) of tailings and contaminated sediment with disposal at the Woodland Park Repository. Soils at removal areas were amended with organic materials, and then revegetated. The stream channel of Canyon Creek was stabilized with bioengineering techniques. |
| Lower Canyon Creek Floodplain | SVNRT | 1997-1998 | Time-critical removal of 472,000 cy of tailings and contaminated materials with disposal at the Woodland Park Repository. Soils at removal areas were amended with organic materials, and then revegetated. The stream channel of Canyon Creek was stabilized with bioengineering techniques. |
| Woodland Park Repository | SVNRT | 1997-1998 | Construction of an unlined repository for disposal/consolidation of removals along Canyon Creek. Repository contains approximately 600,000 cy of contaminated materials. Repository capped with native soils and revegetated. |
| Gem Portal Pilot | BLM, SVNRT, USEPA | 2000-Present | Pilot system created by Asarco (10 gallons per minute) for treatment of drainage from the Gem Portal. Continue to Evaluate Gem Portal Pilot Water Treatment System in context of Canyon Creek Water Treatment Work. |
| **Ninemile Creek** | | | |
| Interstate Tailings Removal | Hecla | 1992-1993 | Removal of tailings adjacent to East Fork Ninemile Creek (EFNMC) with consolidation to a nearby uphill area. Installation of straw bales along perimeter of tailings for erosion control. |

**Table 5-16. Summary of Removal Actions – Operable Unit 3**

| Site Name | Responsible Entity | Dates of Action | Description of Action |
|---|---|---|---|
| Interstate Mill Site | IDEQ, SVNRT | 1998 | Non time-critical removal of ~60,000 cy of tailings, mill debris, and contaminated sediments from the mill site and from EFNMC for 1000 feet downstream. Disposal at an onsite repository. EFNMC stabilized with bioengineering structures in removal areas. |
| Success Mine/Mill Tailings and Waste Rock | Hecla | 1993 | Time-critical removal action included relocation and riprap armoring for ~1,600 feet of EFNMC channel; relocation of streamside tailings; placement of in-stream structures for energy dissipation; capping of tailings pile with 1-foot-thick overburden rock; installation of upgradient groundwater and surface water diversions. |
| Success Mine Site Passive Treatment | IDEQ, SVNRT, USEPA | 2000-Present | Contaminated groundwater diverted by a subsurface grout wall (approximately 1,350 feet in length) to a treatment vault. Groundwater treated using apatite. |
| East Fork Ninemile Creek Floodplain | IDEQ, SVNRT | 1994 | Time-critical removal of ~50,000 cy of flood plain tailings and contaminated sediments with disposal at the Day Rock Repository. Stream reconstruction, riparian stabilization, and revegetation. |
| Ninemile Creek Floodplain near Blackcloud | Hecla, IDEQ | 1994 | Time-critical removal of ~44,000 cy of flood plain tailings and contaminated sediments with disposal at the Day Rock Repository. Stream reconstruction, riparian stabilization, and revegetation. |
| Day Rock Repository | Hecla, IDEQ, SVNRT | 1994 | Approximately 94,000 cy of materials from the floodplain removals were placed on top of the existing Day Rock repository and capped with native soils and growth media. |
| **Pine Creek** | | | |
| Constitution Mine and Mill Site | BLM | 1998-Present | Non-time-critical removal included removal of contaminated soils around the mill with disposal at the Central Impoundment Area (CIA), and realignment of East Fork Pine Creek away from the toe of the tailings pile. Most of the tailings and waste rock dump are on private land and have not been addressed to date. In 2002 at the Upper Constitution Site, the BLM installed a pilot mine water treatment bioreactor unit and a groundwater drain above the upper tailings pile. In 2003, the BLM made modification to the system and installed a ground water drain above the bioreactor. |
| Denver Creek (includes Little Pittsburg, Hilarity, Denver and Mascot Mine) | BLM | 1996-2000 | Time-critical removal of ~5,200 cy of tailings and contaminated soils associated with the Little Pittsburg Mill. No actions have been conducted on the private portion of the pile. The mouth of Denver Creek has been undergoing stabilization and revegetation by the BLM. Regrading at the Mascot Mine was done by the mine owner, Mascot Mining, in 2002. |
| Douglas Mine and Mill Site | USEPA | 1996-1997 | Time-critical removal of two existing tailings impoundments from the flood plain of East Fork Pine Creek. 25,000 cy of contaminated materials were removed and placed into a temporary repository constructed east of Pine Creek Rd. near the mine. |

**Table 5-16. Summary of Removal Actions – Operable Unit 3**

| Site Name | Responsible Entity | Dates of Action | Description of Action |
|---|---|---|---|
| Highland Creek Floodplain | BLM | 1999 | Time-critical removal of 8,100 cy major discrete tailings deposits along Highland Creek on public lands. |
| Highland-Surprise Mine/Mill Site (Includes Nevada Stewart Mine) | BLM | 1999 | Diversion of Highland Creek to reduce erosion of the lower waste rock dump. Most of the facilities at this site are on private land, thus no other actions have been taken to date. In 2001 and 2002, the BLM re-graded the upper and lower rock dumps at Highland Surprise. Along with that effort in 2002, the BLM also re-graded the Nevada Stewart rock dump. |
| Sidney (Red Cloud) Mine/Mill Site | BLM | 1997-Present | Non-time-critical removal of contaminated soils around the mill foundations with disposal at the CIA; run-on and run-off controls; and improvements to the upstream culvert on Red Cloud Creek to control flow through the site and reduce downstream erosion. Passive treatment of adit drainage with inflow prevention at the Sidney Shaft in Denver Creek. Rock dump regraded and hydroseeded in 2000 to minimize erosion. Additional stream channel work at the toe of the dump was performed in 2002. In 2001, the BLM started pilot water treatment efforts with the Sidney Red Cloud tunnel mine discharge. In 2003, a pilot bioreactor water treatment system was installed and is continuing to be operated and monitored. |
| Amy-Matchless Mill Site | BLM | 1996-2000 | Time-critical removal of ~9,600 cy of tailings and contaminated soils in 1996 and 1997. In 1998, a non-time-critical removal action removed an additional 420 cy of residual tailings. Disturbed area covered with soil and revegetated. Mine adit was closed by backfilling. Waste rock dump regraded and revegetated. |
| Liberal King Mine/Mill Site | BLM | 1996-2000 | Time-critical removal of ~9,400 cy of tailings and contaminated soils. In 1998, 99 cy of mill site tailings and mill wastes were removed from the mill area. In 1999, non time-critical removal of an additional 1,800 cy of tailings, regrading backfill of a dry adit, import of growth medium, and revegetation. The 2000 actions included extensive grading and planting of riparian vegetation. There are continuing efforts to further revegetate and stabilize the stream reach with additional streamwork and plantings of shrubs and trees. |
| Nabob Mine/Mill Site | BLM | 1994-2000 | Soil cover over the tailings pile and a portion of mill area; fence to limit access to the mill site and tailings; channel improvements along Nabob Creek to stabilize the channel and prevent erosion of the tailings pile embankment. In 1995, the mine operator seeded and placed soil cover materials over the tailings, but success of the revegetation is limited. In 2000, the BLM started an investigation at the site drilling 20 wells around the pile and mill. Also in 2000, the BLM installed a groundwater cutoff drain above and along the side of the tailings pile. In 2001, the BLM regraded the Nabob Mid-level rock dump. |

**Table 5-16. Summary of Removal Actions – Operable Unit 3**

| Site Name | Responsible Entity | Dates of Action | Description of Action |
|---|---|---|---|
| **Moon Creek** | | | |
| Silver Crescent and Charles Dickens Mines | USFS | 1998-2000 | Non-time-critical removal of ~130,000 cy of tailings, waste rock, contaminated soils, and mill structures, with disposal at an onsite repository. Closure of four adits. Stream relocation and vegetative and structural rehabilitation along approximately 3,300 feet of Moon Creek, and 10 acres of riparian revegetation. |
| Elk Creek Pond at Mouth of Moon Creek | SVNRT, USACE, USEPA | 1994; 2000 | Limited tailings removal in 1994. Clean sand was imported for a recreational beach at this swimming hole. Time-critical removal of 28,000 cy of contaminated sediments and tailings in 2000 (Liverman, 2004). |
| **Upper South Fork** | | | |
| Morning Mine No. 6 | Hecla | 1989; 2000 | Adit drainage directed to subsurface flow, rock-bed filter treatment system. Slaughterhouse Gulch was lined to reduce infiltration through the waste rock pile. |
| Osburn Flats | SVNRT | 1997-1998 | Removal of 133,000 cy of tailings and contaminated soil. Project also tested the application of various in situ treatments to tie up metals. |
| **Grouse Creek** | | | |
| We Like Mine | BLM | 2001-Present | The We Like Mine is in the upper part of Grouse Creek, just above the original Star Mine Rock Dump area. In 2001, the BLM started mine water investigations. In 2003, a pilot bioreactor tank water treatment system was installed. |
| **South Fork** | | | |
| South Fork Floodplain Removals | SVNRT | 1998 | Non-time-critical removals at several areas in the floodplain totaling about 128,000 cy of tailings and contaminated soils. |
| Elizabeth Park Stream Bank Stabilization | SVNRT | 1994; 1999 | The project removed 13,585 cy of tailings from the river and used the material to construct a compacted levee over 2,100 feet long on the south river bank. Additionally, 8,027 tons of riprap was placed on the riverbanks to protect them from further erosion. The project also installed in-channel stabilization, aquatic habitat features, and riparian zone enhancements. Work on the project was initiated in September 1994, and completed in May 1995. In 1999, additional river barbs were installed to enhance aquatic life. |
| **Lower Coeur d'Alene River** | | | |
| Cataldo Mission | Coeur d'Alene Tribe | 1995 | Removal of ~700 cy of tailings and contaminated soils from traditional campground areas in the vicinity of the Cataldo Mission. |

**Table 5-16. Summary of Removal Actions – Operable Unit 3**

| Site Name | Responsible Entity | Dates of Action | Description of Action |
|---|---|---|---|
| Cataldo Boat Ramp | IDEQ | 1996-1997 | Placement of cabled-log bank protection and brush wattling to reduce erosion, and planting of bushes in the vicinity of contaminated soils to discourage human contact with the soils. |
| Black Rock Slough Trailhead/Highway 3 Crossing | USEPA | 2001-2002 | Graded and capped access road and parking area and a trail providing access to Trail of the CDAs, stabilization of 125 feet of eroding river bank. |
| Killarney Lake Boat Launch | BLM | 1991-1998 | Covered contaminated shoreline with geotextile fabric overlain with 12-inch rock. Paved the floodplain area and road, covered edge areas with topsoil and sodded grass, and rebuilt concrete plank boat launch. Provided drinking well and vaulted toilets at the site. |
| Dudley Bank Stabilization | SVNRT | 1999 | Pilot bank erosion project to evaluate effectiveness of rock berms in reducing bank erosion cased by piping, or undercutting by boat wake. The project berms were constructed along 625 feet of the south bank and 720 feet of the north bank of the lower CDA River upstream of the Dudley landing. The berms were constructed with large rocks placed on a geotextile fabric to prevent fine-grained soil from being washed out and undermining the berms. The berms were about 2 feet wide and were placed from 7 to 30 feet from the top of the riverbank. Monitoring in late 2000 found that very little bank erosion had occurred and the berms have remained stable (Golder, 2001c). |
| Medimont Bank Stabilization | IDEQ, Soil Conservation Service | 1994 | Placement of four types of bank erosion control: two with hay bales, two with riprap. Subsequent monitoring indicated that the hay-bale methods were not effective in this portion of the river. |
| Medimont and Rainy Hill Boat Launches | Asarco, Hecla | 1999 | Approximately 1000 cy of clean aggregate capped contaminated parking and access areas, 3- to 6-inch rock placed in shallow areas to discourage children from playing in contaminated sediments, boulders placed to control traffic. |
| Thompson Lake Boat Launch | USEPA | 1999-2000 | Removal of contaminated sediments from shoreline, geotextile fabric placed against bank, and overlain with 12-inch rock. Existing unpaved parking lot rebuilt and capped with asphalt, concrete planks installed to provide boat launch. |
| Anderson Lake Boat Launch | USEPA | 1999 | Removal of contaminated sediments from shoreline, geotextile fabric placed against bank, and overlain with 12-inch rock. Existing unpaved parking lot rebuilt and capped with asphalt, concrete planks installed to provide boat launch. |
| **Trail of the Coeur d'Alenes** (UPRR Wallace-Mullan Branch ROW Removal Actions) | UPRR | 2000-2004 | UPRR conducted a removal action and established a recreational trail on the UPRR ROW in OU3. See Section 5.8 of the report for more information on this removal action. |

## 5.5 Review of OU3 ROD Site-Specific Work and Remedial Actions

Remedial actions in OU3 are being implemented under the interim ROD issued by the USEPA in September 2002. As discussed in Section 5.1, the interim ROD represents a *significant step toward meeting the goal of full protection of human health and the* environment in the Basin.

The USEPA's first priority for implementation of the 2002 OU3 ROD is to remediate residential and recreational areas that pose direct human health risks. Subsequent actions will include cleanup of areas that pose ecological risks. The USEPA has worked extensively with the Basin Commission, the TLG, and the CCC to prioritize implementation of the interim remedy. The following section addresses progress to date on 2002 OU3 ROD remedial action implementation.

### 5.5.1 Remediation in Residential and Community Areas

Remedial actions in the residential and community areas, including identified recreational areas, have been prioritized for completion in OU3. The IDEQ is the lead for implementation of the residential and community area cleanup with USEPA funding and oversight. The USEPA is the lead for implementation of recreational area remediation.

The residential remediation program is comprised of several actions to address human exposure to metals contamination, including remediation of soils contaminated with lead and arsenic, remediation of metals-contaminated private drinking water sources, and evaluation of lead concentrations in house dust.

The RAOs for human health protection in OU3 are described in Chapter 8 of the 2002 OU3 ROD. Recommendations in USEPA guidance (USEPA, 1994 and 1998d) were used to develop the OU3 human health remedy, as compared to the remedy in the 1991 OU1 ROD. As noted in Section 3.1 of this report, the OU1 remedy included a community blood lead goal of no more than 5 percent of children in each community exhibiting a blood lead level greater than 10 µg/dL and less than 1 percent exhibiting a blood lead of 15 µg/dL or greater. This approach was consistent with the USEPA national policy at that time (USEPA, 1989). In the 1998 guidance (USEPA, 1998d), the USEPA recommends that risks be assessed at lead-contaminated residential sites using an exposure unit defined as the individual residence and other areas where routine exposures are occurring. Accordingly, the human health remedy focuses the response actions on the individual property level to reduce lead exposure pathways, such as soil and dust, and ensure that a typical child has no more than a 5 percent risk of exceeding a 10 µg/dL blood lead level. This approach, by targeting cleanup actions at the individual property level, ensures cleanup of all contaminated residential properties in a community, thereby protecting future as well as current residents.

This difference in approach does not substantially change the residential soil cleanup strategy. Both OU1 and OU3 remedies include partial soil removal for yard soil lead concentrations above 1,000 mg/kg; only the OU3 residential remedy includes barrier enhancement for yards with soil lead concentrations between 700 mg/kg and 1,000 mg/kg.

However, the difference in approach does affect the way that annual blood lead screening results are evaluated. While the 1991 OU1 ROD includes a community-level blood lead goal for children, the human health remedy in the 2002 OU3 ROD is focused on reducing lead exposure pathways to reduce risks to children at the individual property level.

The NRC pre-publication report supports the USEPA's human health risk assessment approach as generally sound. For example, the Committee concludes that the analyses used to determine the relative effect of lead in mining wastes and other sources "go beyond normal attempts to attribute elevated blood lead levels to different sources of exposure and that no alternative approaches to apportioning risks would have been preferable given the information available" (NRC, 2005, p. 142).

#### 5.5.1.1 Yard Soil Remediation Progress

Implementation of the OU3 human health remedy was initiated in 2003, therefore, only 2 years of post-ROD information and data exist. However, TCRAs to address high-risk yards and common-use areas were initiated in OU3 in 1997. These removal actions are consistent with the OU3 human health remedy; therefore, soil remediation progress for OU3 includes data from 1997 to the present. From 1997 to 2004, approximately 540 residential properties were remediated in OU3 (Table 5-17).

**Table 5-17. Residential Removal and Remedial Actions by Year Not Including OU1 and OU2**

| Actions | Pre-ROD | | | | | Post-ROD | | |
|---|---|---|---|---|---|---|---|---|
| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
| Residential Yards[a] | 6 | 12 | 23[b] | 25 | 25 | 28 | 91 | 334 |
| Schools/Daycares[c] | 1d | | 3 | 2 | 1 | | | 1 |
| Bottled Water | | | 10 | 1 | | | | |
| Start of end-of-tap water treatment | | | 4 | 1 | | | | 1 |
| Municipal Water Hookup | | | 6 | 6 | | | | Trailer Court |

[a] "Yards" is nomenclature that has been used in the Box. However, in the Basin, the term more commonly used is "property". A property may not only contain a yard but may include discrete areas that require remediation, such as a driveway, play area, and adjacent ROW. If discrete areas of a property were remediated (and not the yard), that property is included in this count. Adjacent City- or County-owned ROWs also may be included in this count.
[b] Two of these yards were remediated in previous years and had follow-up work (e.g., grading) completed in 1999.
[c] This category includes one commercial property, other than a school or daycare, remediated in 2004.
[d]Silver Hills Middle School was started in 1997. Additional work was completed in 1998, 2001, and 2002 due to the extremely large size and coordination with school schedules. Once started, end-of-tap water treatment has been provided each year and will continue until a more permanent solution (e.g., municipal water hookup) is made available.

An important component of soil remediation progress is the annual soil sampling program. Soil sampling is conducted for each property to clarify areas that require remediation. For example, in the Basin, it is not uncommon to find that a home's driveway requires remediation while the home's yard does not. In other words, the sampling results indicate that there may be varying results within a property as well as between different properties.

For OU3, the USEPA and the IDEQ will assess the current risk to children and the dose-response relationship between soil, dust, and paint exposures and blood lead levels using available sampling results for OU3. At the time this five-year review was prepared, the most recent sampling results for OU3 were not finalized. Therefore, a separate report is planned for the fall of 2005 to assess available data regarding exposures to children and the dose-response relationships. Completion of this separate report is consistent with the following recommendation noted in the NRC pre-publication report: "the effectiveness of remedial actions for human health protection needs to be further evaluated" (NRC, 2005, p. 7).

The 2002 OU3 ROD estimated that approximately 1,400 residential yards would have concentrations greater than 700 mg/kg lead or 100 mg/kg arsenic concentrations. The ROD also estimated that there are approximately 4,600 residential yards in the Basin. From 2002 to the present, approximately 1,600 residential properties have been sampled in OU3. Although post-ROD soil sampling has been underway for only two years, data collected to-date indicate that the percentage of residential yards (including driveways) and street rights-of-way exceeding soil action levels is higher than the ROD estimate in some communities. Whether this trend will continue as soil sampling is completed in OU3 is not known at this time. As sampling progresses, the IDEQ and the USEPA will be able to clarify the total number of properties requiring remediation in the OU3 residential and community areas. Tables 5-18 to 5-20 provide a summary of the residential properties sampled from 2002 to 2004. An update on soil sampling and remediation progress will be provided in the next five-year review report.

**Table 5-18. Results from 2002 Basin Sampling by Sample Location in All Areas**

| Sample Location | Removal | | Greening | | Resample [a] | | No Action | | Total Number of Locations Sampled |
|---|---|---|---|---|---|---|---|---|---|
| | Pb ≥1,000 mg/kg and/or As ≥100 mg/kg | | Pb ≥ 700 - 999 mg/kg | | Pb ≥ 900 - 999 mg/kg and/or As ≥ 60 -99 mg/kg | | Pb <700 mg/kg and As <100 mg/kg | | |
| Yard | 44 (2) | 31% | 16 | 11% | 3 (1) | 2% | 77 | 55% | 140 |
| Driveway | 48 (2) | 79% | 1 | 2% | - | - | 12 | 20% | 61 |
| Flower Bed | 2 | 29% | - | - | - | - | 5 | 71% | 7 |
| Garden | 14 (1) | 39% | - | - | 1 (1) | 3% | 21 | 58% | 36 |
| Parking | 15 (3) | 94% | 1 | 6% | - | - | - | - | 16 |
| Right-of-Way | 73 (1) | 89% | 3 | 4% | - | - | 6 | 7% | 82 |
| Play Area | 1 | 25% | - | - | - | - | 3 | 75% | 4 |
| Other Area [b] | 15 (3) | 60% | 1 | 4% | - | - | 9 | 36% | 25 |

[a] Resample results from 2003 data are taken into account. The resample result will replace an original result if a higher concentration is observed and the remedial action is no longer "resample".
[b] Other Discrete Area samples include: inside garages, shops, sheds, gravel areas, under decks, dog kennels, wood piles, sand boxes, and horseshoe pits.
[c]Greening is commonly used to refer to barrier enhancement.
Pb = lead, As = arsenic
( ) parenthesis values correspond to the number of sample locations requiring remedial action due to arsenic. These values are not in addition to the total shown, but are included in the total (i.e., of the 44 yards requiring removal, 2 require removal because of high arsenic concentration collocated with low lead concentration).

**Table 5-19. Results from 2003 Basin Sampling by Sample Location in All Areas**

| Sample Location | Removal | | Greening | | Resample[a] | | No Action | | Total Number of Locations Sampled |
|---|---|---|---|---|---|---|---|---|---|
| | Pb ≥ 1,000 mg/kg - and/or As ≥100 mg/kg | | Pb ≥ 700 - 999 mg/kg | | Pb ≥ 900 - 999 mg/kg and/or As ≥ 60 -99 mg/kg | | Pb <700 mg/kg and As <100 mg/kg | | |
| Yard | 319 (14) | 33% | 38 | 4% | 29 (11) | 3% | 572 | 60% | 958 |
| Driveway | 271 (13) | 80% | 9 | 3% | 16 (11) | 5% | 42 | 12% | 338 |
| Flower Bed | 43 (3) | 28% | 5 | 3% | 2 (1) | 1% | 106 | 68% | 156 |
| Garden | 33 | 35% | - | - | - | - | 62 | 65% | 95 |
| Parking | 138 (9) | 66% | 8 | 4% | 13 (9) | 6% | 49 | 24% | 208 |
| Right-of-Way | 696 (21) | 76% | 54 | 6% | 34 (16) | 4% | 137 | 15% | 921 |
| Play Area | 3 | 20% | 1 | 7% | 1 (1) | 7% | 10 | 67% | 15 |
| Other Area[b] | 137 (10) | 52% | 9 | 3% | 14 (9) | 5% | 105 | 40% | 265 |

[a] Resample results from 2003 data are taken into account. The resample result will replace an original result if a higher concentration is observed and the remedial action is no longer "resample".
[b] Other Discrete Area samples include: inside garages, shops, sheds, gravel areas, under decks, dog kennels, wood piles, sand boxes, and horseshoe pits.
[c]Greening is commonly used to refer to barrier enhancement.
Pb = lead, As = arsenic
( ) parenthesis values correspond to the number of sample locations requiring remedial action due to arsenic. These values are not in addition to the total shown, but are included in the total (i.e., of the 319 yards requiring removal, 14 require removal because of high arsenic concentration co-located with low lead concentration).

**Table 5-20. Results from 2004 Basin Sampling by Sample Location in All Areas***

| Sample Location | Removal | | Greening | | Resample[a] | | No Action | | Total Number of Locations Sampled |
|---|---|---|---|---|---|---|---|---|---|
| | Pb ≥1,000 mg/kg and/or As ≥100 mg/kg | | Pb ≥700 - 999 mg/kg | | Pb ≥900 - 999 mg/kg and/or As ≥ 60-99 mg/kg | | Pb <700 mg/kg and As <100 mg/kg | | |
| Yard | 200 | 35% | 43 | 7% | 25 | 4% | 311 | 54% | 579 |
| Driveway | 173 | 70% | 9 | 4% | 18 | 7% | 46 | 19% | 246 |
| Flower Bed | 84 | 31% | 19 | 7% | 17 | 6% | 154 | 56% | 274 |
| Garden | 44 | 35% | 0 | 0% | 3 | 2% | 79 | 63% | 126 |
| Parking | 125 | 76% | 3 | 2% | 3 | 2% | 34 | 21% | 165 |
| Right-of-Way | 350 | 70% | 32 | 6% | 23 | 5% | 92 | 19% | 497 |
| Play Area | 0 | 0% | 1 | 10% | 2 | 20% | 7 | 70% | 10 |
| Other Area[b] | 212 | 51% | 24 | 6% | 20 | 5% | 159 | 38% | 415 |
| Road | 25 | 63% | 5 | 13% | 2 | 5% | 8 | 20% | 40 |

[a] Resample results from 2004 data are not included in this table.
[b] Other Discrete Area samples include: inside garages, shops, sheds, gravel areas, under decks, dog kennels, wood piles, sand boxes, and horseshoe pits.
[c]Greening is commonly used to refer to barrier enhancement.
Pb = lead, As = arsenic
*Note: not all 2004 data are included here as final QA/QC is currently underway on the last 20 percent of the data.

#### 5.5.1.2 Yard Soil Concentrations

The USEPA and the IDEQ will monitor reductions in OU3 lead soil concentrations as soil remediation is completed. Reductions will be monitored in surface soils since soil remediation is limited to the top 6 to 12 inches of contaminated soils and contamination at depth will remain largely unchanged. An update on reductions in soil concentrations will be discussed in the next five-year review.

#### 5.5.1.3 House Dust Concentrations

Similar to OU1, the OU3 long-term human health cleanup strategy includes remediation of contaminated soils and placement of clean soil barriers throughout the Site to reduce house dust lead levels. House dust lead concentrations, dust loading rates, and lead loading rates are being monitored in OU3 as soil remediation is implemented. Results from the 2004 house dust monitoring program are still being finalized. However, once finalized, these data will be used to develop an exposure profile for the 2004 resident population by pairing available soil, dust, and paint data for homes with children in residence with blood lead screening results. The exposure profile will be included in the report planned for the fall of 2005 (noted in Section 5.5.1.1).

#### 5.5.1.4 Drinking Water Remediation

The OU3 human health remedy includes actions to address contaminated drinking water for homes on private wells. These actions also were conducted as part of the time-critical removal actions discussed in Section 5.4.1 of this report. As part of the remedy, alternate water supplies are being provided to homes on contaminated private wells. These alternatives may include connection to the existing public water supply system and provision of point-of-use treatment. Table 5-17 summarizes the drinking water remedial actions conducted from 1997 to 2004. Since issuance of the ROD, a contaminated well was identified for a local trailer court that also serves as a summer campground. The trailer court was connected to the local public water supply in 2004.

#### 5.5.1.5 Lead Health Intervention Program

The PHD has been providing annual blood lead screening services in OU3 since 1996. The services are provided through the Lead Health Intervention Program (LHIP). The LHIP services for OU3 are similar to OU1, namely that activities include efforts to intervene in lead absorption pathways through biological monitoring, follow-up, parental awareness and counseling, education, and behavior modification. Funding from 1996 to 2003 was provided through federal grants to the Idaho Department of Health and Welfare (IDHW), Division of Health. Funding in 2004 was provided by the IDEQ. The NRC pre-publication report recommends that "blood lead screening of all children aged 1-4 years living in the basin be initiated in conjunction with local health care providers. Results should be used to evaluate the efficacy of the environmental interventions" (NRC, 2005, p. 160). As noted in the following section, a number of physician outreach activities have been undertaken at the Site. The State of Idaho and the USEPA will continue to consider ways to improve the health services that are provided to area residents.

### Education and Awareness Efforts

The LHIP seeks to reduce intake and absorption of lead by educating parents and children in the community. For example, the LHIP advises parents how to help their children ingest less dirt through improved hygiene and limiting access to sources, and to reduce absorption through nutritional measures. Lead health information also has been integrated into existing programs. This information has been added to the Well Child Program, Immunization Clinics, Woman Infant and Children (WIC) Clinics, and pregnancy screening and prenatal clinics offered by the PHD. Prenatal blood lead screening is available for all pregnant women in the area through the LHIP. Pregnant women are offered blood lead testing and nutritional counseling during the first and third trimesters, and are advised to provide their blood lead and exposure history to their private physicians. It is also recommended that a cord blood sample be collected when the child is born.

A physician awareness program also has been developed to keep local physicians apprised of program activities and the services that are available. Reference materials and a resource manual regarding lead and other heavy metals have been provided to area physicians and the local hospital. Upon request, additional follow-up activities and sampling can be conducted on behalf of physicians with special concerns regarding a patient with an elevated blood lead level. In addition, a public health nurse and a senior environmental health specialist are available for consultations regarding sources of exposure to lead and the management of exposure pathways. A variety of locally developed and commercial fact sheets, brochures, coloring books, and videos are available regarding lead and children, and exposure to lead during pregnancy.

As in OU1, each year a public health nurse visits area grade schools. Classes are conducted for students in kindergarten through the third grade, and the nurse is available for presentations to classes through the 12th grade. Various methods are used including a puppet show and doll house to teach the concepts. The presentation covers the students' role in identification and management of exposure pathways that may affect them or their siblings. The program is presented in May to remind children of the hazards of lead in soil and dust prior to summer vacation, when they are at the greatest risk of exposure.

### Blood Lead Levels

In OU3, blood lead and exposure surveys have been conducted every summer from 1996 to 2004. In the 1996 Basin study, participants were solicited at their homes for both blood lead samples and an environmental survey of the residence. Most of the families contacted consented to the environmental survey, and samples were collected from 843 homes. A total of 667 adults and 98 children aged 9 months through 9 years provided blood lead samples in 1996. Fixed-site blood lead screenings have been conducted each year in OU3 from 1997 to the present. Initially, participation in fixed-site screenings was relatively low, causing concern among public health authorities that several children with high blood lead levels among the Basin-wide population were going undetected, and that the results may not be representative of non-participants. Therefore, additional incentives were added to the 1999 screening program. For example, government and mining industry officials agreed to jointly support a fixed-site screening and each participant was offered $40 to provide a blood sample. Participation levels were higher as a result of the increased solicitation efforts in 1999, with participation of approximately 25 percent of the children estimated to live in

OU3. However, participation continued to be age-biased and several children were repeats from earlier years. OU3 blood lead data up to 1999 are discussed in the Human Health Risk Assessment (HHRA) (USEPA, 2001d).

As noted in the HHRA, summary results for the 1996 to 1999 timeframe indicate that about 15 percent of children 6 months to 6 years of age tested had blood lead levels of 10 µg/dL or greater, and 7 percent were greater than or equal to 15 µg/dL. In 2000 and 2001, 14 percent and 6 percent, respectively, of 6-month to 6-year-old children showed concentrations above 10 µg/dL, and 4 percent and 2 percent, respectively, exceeded 15 µg/dL. In 2000, the geometric mean blood lead level for the Basin was 4.0 µg/dL (Table 5-21). This value was similar to that noted in the HHRA for the preceding 4 years. In 2001, the geometric mean dropped to 3.7 µg/dL (Table 5-22), indicating that blood lead levels decreased significantly by 2001 among participating children.

Several response activities were undertaken in OU3 that may have reduced exposures and blood lead levels in 2001. Through 2001, the LHIP provided follow-up investigations and consultation to families of 72 Basin children identified with elevated blood lead levels. Exposure to contaminated soils and dusts at the home and/or from recreational areas was the most significant factor identified in these children's risk profiles. Through 2001, yard soils from 91 residences, home to an estimated 150 to 200 children, were remediated as part of the time-critical removal program. Also, several schools and recreational areas were remediated as part of the time-critical removal program. As a result, nearly 20 percent of all children in the Basin, including most of those at greatest risk of exposure, received direct remediation and/or intervention by 2001.

Fixed-site screening using capillary blood lead in OU3 has continued from 2002 to the present. The number of participants has decreased by about one-fifth, from more than 100 in 2002 to 82 children in 2004 (less than 15 percent of the population) (Tables 5-23 and 5-25). Geometric mean blood lead levels were 3.2 µg/dL to 3.4 µg/dL for all 3 years and a total of nine children exhibited levels greater than 10 µg/dL during the 3-year period. These results indicate that absorption levels have remained similar to those observed in 2001, and are reduced from the pre-ROD situation. The degree of exposure reductions associated with the OU3 cleanup actions will be further evaluated in the report planned for the fall of 2005 (noted in Section 5.5.1.1). A similar decline in absorption was noted in OU1 in 1990-1991 following the implementation of the high-risk yard cleanup program.

Tables 5-21 to 5-26 provide the annual blood lead screening results by geographic subarea for 2000 through 2004.

**Table 5-21. 2000 Basin Blood Lead Summary Statistics by Geographic Area (0-9 years)**

| Area | Number of Observations | Blood Lead Level Range (µg/dL) | | Mean Blood Lead Level (µg/dL) | | | | N ≥10 (µg/dL) | % ≥10 (µg/dL) | N ≥15 (µg/dL) | % ≥15 (µg/dL) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Minimum | Maximum | Arithmetic Mean | Standard Deviation | Geometric Mean | Geometric Standard Deviation | | | | |
| Burke/Ninemile | 7 | 1.0 | 15.0 | 7.0 | 5.4 | 5.1 | 2.55 | 2 | 28.6% | 1 | 14.3% |
| Kingston | 33 | 1.0 | 14.0 | 3.9 | 3.0 | 3.0 | 2.07 | 2 | 6.1% | 0 | 0.0% |
| Lower Basin | 15 | 1.0 | 27.0 | 7.1 | 6.9 | 5.1 | 2.30 | 3 | 20.0% | 2 | 13.3% |
| Mullan | 6 | 2.0 | 10.0 | 5.2 | 2.9 | 4.5 | 1.79 | 1 | 16.7% | 0 | 0.0% |
| Osburn | 43 | 1.0 | 15.0 | 4.4 | 2.7 | 3.8 | 1.76 | 2 | 4.7% | 1 | 2.3% |
| Side Gulches | 29 | 2.0 | 10.0 | 4.5 | 2.0 | 4.1 | 1.54 | 1 | 3.4% | 0 | 0.0% |
| Silverton | 19 | 1.0 | 17.0 | 5.3 | 3.9 | 4.1 | 2.15 | 2 | 10.5% | 1 | 5.3% |
| Wallace | 16 | 2.0 | 14.0 | 5.4 | 3.1 | 4.8 | 1.66 | 2 | 12.5% | 0 | 0.0% |
| **Basin Wide** | **168** | **1.0** | **27.0** | **4.9** | **3.6** | **4.00** | **1.92** | **15** | **8.9%** | **5** | **3.0%** |

**Table 5-22. 2001 Basin Blood Lead Summary Statistics by Geographic Area (0-6 years)**

| Area | Number of Observations | Blood Lead Level Range (µg/dL) | | Mean Blood Lead Level (µg/dL) | | | | N ≥10 (µg/dL) | % ≥10 (µg/dL) | N ≥15 (µg/dL) | % ≥15 (µg/dL) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Minimum | Maximum | Arithmetic Mean | Standard Deviation | Geometric Mean | Geometric Standard Deviation | | | | |
| Burke/Ninemile | - | - | - | - | - | - | - | - | - | - | - |
| Kingston | 34 | 1.4 | 7.7 | 3.8 | 2.0 | 3.3 | 1.77 | 0 | 0.0% | 0 | 0.0% |
| Lower Basin | 17 | 1.4 | 16.0 | 4.2 | 3.8 | 3.3 | 1.98 | 2 | 11.8% | 1 | 5.9% |
| Mullan | 10 | 2.2 | 9.2 | 5.5 | 2.6 | 4.9 | 1.71 | 0 | 0.0% | 0 | 0.0% |
| Osburn | 23 | 1.4 | 11.0 | 3.4 | 2.0 | 3.0 | 1.62 | 1 | 4.3% | 0 | 0.0% |
| Side Gulches[a] | 21 | 1.4 | 16.0 | 5.4 | 3.6 | 4.6 | 1.78 | 3 | 14.3% | 1 | 4.8% |
| Silverton | - | - | - | - | - | - | - | - | - | - | - |
| Wallace[b] | 12 | 1.6 | 12.0 | 6.3 | 3.0 | 5.5 | 1.75 | 1 | 8.3% | 0 | 0.0% |
| **Basin Wide** | **117** | **1.4** | **16.0** | **4.5** | **2.9** | **3.7** | **1.82** | **7** | **6.0%** | **2** | **1.7%** |

[a] Includes 3 samples from Silverton to preserve confidentiality.
[b] Includes 2 samples for Burke/Nine Mine to preserve confidentiality.

Table 5-23. 2002 Basin Blood Lead Summary Statistics by Geographic Area (0-6 years)

| | | Blood Lead Level Range (µg/dL) | | Mean Blood Lead Level (µg/dL) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Area | Number of Observations | Minimum | Maximum | Arithmetic Mean | Standard Deviation | Geometric Mean | Geometric Standard Deviation | N ≥10 (µg/dL) | % ≥10 (µg/dL) | N ≥15 (µg/dL) | % ≥15 (µg/dL) |
| Burke/Ninemile | 10 | 2.7 | 6.0 | 4.1 | 1.2 | 3.9 | 1.35 | 0 | 0.0% | 0 | 0.0% |
| Kingston | 21 | 1.4 | 13.0 | 3.4 | 2.7 | 2.8 | 1.73 | 1 | 4.8% | 0 | 0.0% |
| Lower Basin | 17 | 1.4 | 11.0 | 3.9 | 2.9 | 3.2 | 1.93 | 1 | 5.9% | 0 | 0.0% |
| Mullan | 8 | 1.4 | 7.0 | 3.9 | 1.7 | 3.5 | 1.64 | 0 | 0.0% | 0 | 0.0% |
| Osburn | 18 | 1.4 | 13.0 | 3.7 | 2.8 | 3.1 | 1.79 | 1 | 5.6% | 0 | 0.0% |
| Side Gulches | 11 | 1.8 | 3.3 | 2.4 | 0.5 | 2.3 | 1.24 | 0 | 0.0% | 0 | 0.0% |
| Silverton | 7 | 1.7 | 6.2 | 3.4 | 1.4 | 3.2 | 1.48 | 0 | 0.0% | 0 | 0.0% |
| Wallace | 11 | 2.3 | 13.0 | 5.0 | 3.3 | 4.2 | 1.82 | 1 | 9.1% | 0 | 0.0% |
| **Basin Wide** | **103** | **1.4** | **13.0** | **3.7** | **2.4** | **3.2** | **1.70** | **4** | **3.9%** | **0** | **0.0%** |

Table 5-24. 2003 Basin Blood Lead Summary Statistics by Geographic Area (0-6 years)

| | | Blood Lead Level Range (µg/dL) | | Mean Blood Lead Level (µg/dL) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Area | Number of Observations | Minimum | Maximum | Arithmetic Mean | Standard Deviation | Geometric Mean | Geometric Standard Deviation | N ≥10 (µg/dL) | % ≥10 (µg/dL) | N ≥15 (µg/dL) | % ≥15 (µg/dL) |
| Burke/Ninemile | - | - | - | - | - | - | - | - | - | - | - |
| Kingston | 15 | 1.4 | 4.1 | 2.5 | 0.9 | 2.3 | 1.49 | 0 | 0.0% | 0 | 0.0% |
| Lower Basin | 18 | 1.0 | 17.1 | 5.4 | 4.8 | 4.0 | 2.14 | 3 | 16.7% | 2 | 11.1% |
| Mullan | 5 | 2.7 | 6.7 | 4.6 | 1.5 | 4.4 | 1.42 | 0 | 0.0% | 0 | 0.0% |
| Osburn | 15 | 2.0 | 7.5 | 4.5 | 2.0 | 4.1 | 1.59 | 0 | 0.0% | 0 | 0.0% |
| Side Gulches | 17 | 1.4 | 7.9 | 3.4 | 1.5 | 3.2 | 1.46 | 0 | 0.0% | 0 | 0.0% |
| Silverton | - | - | - | - | - | - | - | - | - | - | - |
| Wallace[a] | 5 | 2.2 | 7.0 | 4.0 | 2.3 | 3.6 | 1.74 | 0 | 0.0% | 0 | 0.0% |
| **Basin Wide** | **75** | **1.0** | **17.1** | **4.1** | **2.8** | **3.4** | **1.74** | **3** | **4.0%** | **2** | **2.7%** |

[a] Includes 1 sample from Burke/Ninemile, 3 from Silverton, and 1 from Wallace to preserve confidentiality.

**Table 5-25. 2004 Basin Blood Lead Summary Statistics by Geographic Area (0-6 years)**

| Area | Number of Observations | Blood Lead Level Range (µg/dL) | | Mean Blood Lead Level (µg/dL) | | | | N ≥10 (µg/dL) | % ≥10 (µg/dL) | N ≥15 (µg/dL) | % ≥15 (µg/dL) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Minimum | Maximum | Arithmetic Mean | Standard Deviation | Geometric Mean | Geometric Standard Deviation | | | | |
| Burke/Ninemile | - | - | - | - | - | - | - | - | - | - | - |
| Kingston | 18 | 1.6 | 6.1 | 3.2 | | 3.1 | | 0 | 0.0% | 0.0 | 0.0% |
| Lower Basin | 20 | 1.4 | 7.1 | 3.3 | | 2.9 | | 0 | 0.0% | 0.0 | 0.0% |
| Mullan | 7 | 3.0 | 5.0 | 3.9 | | 3.8 | | 0 | 0.0% | 0.0 | 0.0% |
| Osburn | 18 | 1.4 | 6.0 | 3.9 | | 3.5 | | 0 | 0.0% | 0.0 | 0.0% |
| Side Gulches[a] | 10 | 1.4 | 7.4 | 3.7 | | 3.0 | | 0 | 0.0% | 0.0 | 0.0% |
| Silverton | - | - | - | - | - | - | - | - | - | - | - |
| Wallace[b] | 9 | 3.2 | 16.7 | 6.6 | | 5.6 | | 2 | 22.2% | 1.0 | 11.1% |
| **Basin Wide** | **82** | **1.4** | **16.7** | **3.9** | | **3.4** | | **2** | **2.4%** | **1** | **1.2%** |

[a] Includes samples from Silverton to preserve confidentiality.
[b] Includes samples from Burke to preserve confidentiality.

**Table 5-26. Basin Blood Lead Summary by Year, 1996-2004 (age 0-6 only)**

| Area | Number of Observations | Blood Lead Level Range (µg/dL) | | Mean Blood Lead Level (µg/dL) | | | | N ≥10 (µg/dL) | % ≥10 (µg/dL) | N ≥15 (µg/dL) | % ≥15 (µg/dL) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Minimum | Maximum | Arithmetic Mean | Standard Deviation | Geometric Mean | Geometric Standard Deviation | | | | |
| 1996 | 58 | 1.0 | 18.0 | 5.2 | 4.2 | 8 | 14.0% | 3 | 5.0% | 0 | 0.0% |
| 1997 | 13 | 2.0 | 19.0 | 6.0 | 4.9 | 2 | 15.0% | 1 | 8.0% | 0 | 0.0% |
| 1998 | 70 | 2.0 | 21.0 | 6.3 | 5.4 | 9 | 13.0% | 4 | 6.0% | 2 | 3.0% |
| 1999 | 162 | 1.0 | 29.0 | 6.4 | 5.2 | 26 | 16.0% | 12 | 7.0% | 4 | 3.0% |
| 2000 | 102 | 1.0 | 27.0 | 5.8 | 4.8 | 14 | 14.0% | 4 | 4.0% | 1 | 1.0% |
| 2001 | 117 | 1.4 | 16.0 | 4.5 | 3.7 | 7 | 6.0% | 2 | 1.7% | 0 | 0.0% |
| 2002 | 103 | 1.4 | 13.0 | 3.7 | 3.2 | 4 | 4.0% | 0 | 0.0% | 0 | 0.0% |
| 2003 | 75 | 1.0 | 17.1 | 4.1 | 3.4 | 3 | 4.0% | 2 | 2.7% | 0 | 0.0% |
| 2004 | 82 | 1.4 | 16.7 | 3.9 | 3.4 | 2 | 2.4% | 1 | 1.2% | 0 | 0.0% |

### *Annual Home Follow-up Summaries*

The LHIP provides follow-up lead counseling for families with children exhibiting elevated blood lead levels. A PHD public health nurse and/or a senior environmental health specialist contacts the parents of each child with an elevated blood lead level. The health specialist and nurse provide counseling and written information on how to identify sources of lead and reduce the child's exposure. A questionnaire is completed and educational materials are provided to the parents of children with a blood lead equal to or greater than intervention levels. Nutritional counseling and multiple vitamins with iron also have been provided. A follow-up blood screening is offered 3 to 4 months later, and it is recommended that the child's blood lead information be shared with the family physician and that the child participate in the following annual screening program.

From 2000 to 2004, the majority of children with elevated blood lead levels received some form of follow-up (approximately 33 children were contacted). Exposure profiles identified pathways such as elevated lead levels in home yard soil and interior dust, recreational exposures along the Coeur d'Alene River, pica-like tendencies, demolition material from home remodeling projects, and homes with lead paint.

### *Door-to-Door Survey*

In 2004, a door-to-door survey was conducted in OU3 to accomplish several goals, including gathering information for the residential remediation program (e.g., securing sampling consent from property owners), identifying homes with children in residence, and encouraging parents to have their children's blood lead levels tested. Soil sampling for homes contacted through the door-to-door survey was conducted during the 2004 season. The report planned for the fall of 2005 will include information collected during the 2004 door-to-door survey.

### 5.5.1.6 Institutional Controls Program

Similar to OU1/OU2, an ICP is a critical component of the OU3 selected human health remedy and is needed to ensure remedy success. Section 5.3.1 of this report discusses the importance of the ICP in the Basin. Refer to Section 5.3.1 for the issues and recommendations related to the OU3 ICP.

### 5.5.1.7 Repository

As seen in OU1/OU2, both current and long-term disposal needs must be identified and addressed to ensure successful implementation of the remedy. Repository space is needed for both remedial action and ICP waste. Section 5.5.6 of this report describes the repository siting process completed to date that will support identification of additional repositories in the Upper and Lower Basin and operations of the Big Creek Repository.

### 5.5.1.8 Infrastructure

Implementing adequate infrastructure upgrades and ongoing maintenance to protect the remedy is as important in OU3 as it is in OU1/OU2. Infrastructure issues affecting local communities are discussed in an IDEQ memorandum entitled *The Role of Community Infrastructure in the Cleanup: Bunker Hill Superfund Site* (TerraGraphics, 2005a). Resources to repair and install infrastructure that will help prevent recontamination of protective barriers should be identified. This work will need to be coordinated among the various stakeholders including local governments, the Basin Commission, the IDEQ, and the USEPA.

#### 5.5.1.9 Technical Assessment of Residential Remediation

Per USEPA guidance (USEPA, 2001e), technical assessments of the Residential and House Dust remedial actions, the LHIP, and infrastructure programs were conducted by evaluating the following three questions related to protectiveness of the implemented actions:

- Question A: Is the remedy functioning as intended by the decision documents?
- Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?
- Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

##### *Residential Soil Remediation*

***Question A: Is the remedy functioning as intended by the decision documents?***

The review of documents, ARARs, and risk assumptions indicates that the remedy is functioning as intended by the 2002 OU3 ROD. The remedy is expected to be protective when it is completed.

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

There is no other information that calls into question the protectiveness of the remedy at this time. The NRC report is expected to be finalized in December 2005. The USEPA and the IDEQ will continue to evaluate the report to determine if the recommendations could affect the analyses conducted to evaluate remedy performance.

##### *House Dust Remediation*

***Question A: Is the remedy functioning as intended by the decision documents?***

The need for interior cleaning will be evaluated after residential soil remediation is completed, taking into consideration implementability, sustainability, ongoing OU3 house dust monitoring results and actions taken in OU1. The remedy is expected to be protective when completed.

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

The exposure assumptions, toxicity data, and RAOs used at the time of remedy selection are still valid. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

#### Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

There is no other information that calls into question the protectiveness of the remedy at this time. The USEPA and the IDEQ will evaluate the findings of the NRC final report (referred to above) to determine if the recommendations could affect the evaluation of remedy protectiveness.

### Lead Health Intervention Program

#### Question A: Is the remedy functioning as intended by the decision documents?

The LHIP is functioning as intended for those residents participating in the program. One of the primary program concerns is the relatively low level of participation in the annual blood lead screening program compared to the number of eligible resident children. This may be related, in part, to the dispersed nature of the population compared OU1 and the lower blood lead levels found in Basin children relative to the blood lead levels identified in children in the 1980s and early 1990s in OU1.

#### Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

#### Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

The ATSDR has indicated that it is unable to fund this program in the Basin. In 2004, the IDEQ funded the program. Continued funding is necessary for the program to continue. As noted above, the NRC final report will be evaluated to determine if the recommendations could affect the evaluation of remedy protectiveness.

### Repository

See Section 5.5.6 of this report.

### Infrastructure

#### Question A: Is the remedy functioning as intended by the decision documents?

The review of documents, ARARs, and risk assumptions indicates that the remedy is functioning as intended by the ROD. The remedy is expected to be protective when it is completed. Similar to OU1, the success of the remedy relies on adequate infrastructure upgrades and maintenance to prevent recontamination of protective barriers. Failure to address infrastructure inadequacies may result in the loss of significant portions of the installed remedy and ultimate remedy failure.

#### Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

### *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

Infrastructure improvements and ongoing maintenance of existing infrastructure are needed to ensure long-term success of the remedy. An infrastructure plan should be developed so that the local governments can prioritize needs and seek funding for infrastructure improvements. State and federal governments, including the IDEQ and the USEPA, should assist with the identification of resources. The NRC final report will be evaluated to determine if the recommendations could affect the evaluation of remedy protectiveness.

### *Remedy Issues*

**Table 5-27. Summary of Residential and Common-use Areas Remediation Issues**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **Lead Health Intervention Program:** Funding for this program has been discontinued by ATSDR. The IDEQ funded LHIP activities in 2004. Annual blood lead screening participation rates have declined in the last three years. | N | Y |
| **Infrastructure:** Infrastructure upgrades and maintenance are critical to long-term remedy success. Resources to repair and install infrastructure that will help prevent recontamination of protective barriers need to be identified. State and federal governments will need to assist with the identification of resources. | Y | Y |

### *Recommendations*

**Table 5-28. Summary of Residential and Common-use Areas Remediation Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Human Health Exposure Profile:** Complete an updated exposure profile for OU3. | IDEQ, USEPA | USEPA | 12/2006 | N | Y |
| **Implement Actions:** Continue to implement remedial actions. | IDEQ | USEPA | 12/2009 | Y | Y |
| **Lead Health Intervention Program:** Identify additional funding sources for the LHIP. Continue to evaluate options for increasing participation in annual blood lead screening program. | IDEQ, PHD, USEPA | USEPA | 12/2005 | N | Y |
| **Infrastructure:** Work with Basin communities and state and federal agencies on an infrastructure plan to ensure remedy success. | IDEQ | PHD, USEPA | 12/2008 | Y | Y |

#### 5.5.1.10 Coeur d'Alene Lake Fish Investigation

##### *Review of ROD Requirements*

Section 12.1 of the 2002 OU3 ROD notes that the fish investigation is being implemented to address the human health-related data gap regarding Coeur d'Alene Lake fish consumption (USEPA, 2002a). Previous evaluations of fish tissue from Coeur d'Alene Lake did not include whole fish and only a limited number of fillets were sampled. As a consequence, some uncertainty about the potential risks resulting from eating fish from the lake was identified in the human health risk assessment prepared for OU3 (USEPA, 2001d). Questions have been raised regarding the need to further evaluate potential risks of humans who eat fish or fillets taken from fish in the lake (see Section 12.3 of USEPA 2002 OU3 ROD).

##### *Background and Description of Study*

The human health risk assessment for OU3 concluded that there were insufficient data available on contaminant concentrations in fish in Coeur d'Alene Lake to quantify potential human health risks (USEPA, 2001d). Potential exposure to contaminants from consumption of fish taken from Coeur d'Alene Lake had not been quantified.

In 2002, a joint study was conducted by the agencies and tribes to determine if fish caught in Coeur d'Alene Lake by recreational and tribal fishers are safe to eat (USEPA, 2002c). The following entities were involved in the design of the study and the collection and/or interpretation of the study results: the USEPA, the Coeur d'Alene Tribe, the USFWS, the IDFG, the IDHW, the Spokane Tribe, the ATSDR, and the Washington State Department of Ecology.

The study was designed to enable the IDHW and the ATSDR to assess the health implications of consumption of fish caught in the lake and to give the agencies a more complete understanding of metals concentrations in fish from the lake. If warranted, the IDHW has responsibility to issue fish consumption advisories in Idaho.

Based on extensive discussion among scientists and interested parties, bullhead (mostly brown bullhead, *Amerius nebulosus*), bass (mostly largemouth bass, *Micropterus salmoides*) and kokanee (*Oncorhynchus nerka*) were collected and tested because of their use by both tribal and sport/recreational fishers. All three species are extensively used by tribal subsistence fishers. Notably, the three species are also of ecological importance to the Coeur d'Alene Lake fishery and encompass a variety of feeding habits and exposure patterns to contaminants.

Kokanee are primarily planktonivorous, feeding on microscopic plants and animals, whereas largemouth bass are predatory towards other fish. Kokanee range throughout the lake, whereas bass are lurking predators with a relatively small home range compared to kokanee. The large home range of kokanee means that they should serve as a good indicator of contaminant concentrations throughout Coeur d'Alene Lake. Largemouth bass, which prey on other fish and have a smaller home range, should be more indicative of contaminant concentrations in localized areas of the lake. Smallmouth bass were also collected during the field effort. Bullheads are mostly bottom feeders and are normally closely associated with bottom sediments. Together, these fish provide a good picture of where and to what extent metals are accumulating in fish. The fish were collected throughout the lake from areas typically used by tribal and recreational fishers. Largemouth bass and bullhead were collected in early May 2002. Kokanee were collected in mid-August 2002.

The tissue types analyzed were intended to be representative of two of the major methods by which fish are caught in Coeur d'Alene Lake and prepared for consumption by subsistence and sport/recreational fishers, i.e., gutted whole fish and fillets. The gutted whole fish tissue type consisted of remaining tissue after the removal of the caudal (tail) fin, gills, and guts with the exception of the kidney. The gutted whole fish carcass tissue sample was intended to represent the most commonly used preparation method for fish that are smoked, canned, and used in soups and stews. Fillets are commonly consumed by tribal, sport, and recreational fishers.

Both fish fillets and gutted whole fish were analyzed for metals concentrations. Fish tissue samples were analyzed for arsenic, cadmium, lead, mercury, and zinc. The results of the laboratory analysis of the fish samples are provided in the Coeur d'Alene Lake Fish Investigation Data Report (USEPA, 2003d).

The IDHW, the Coeur d'Alene Tribe, and the ATSDR evaluated the fish tissue data. Based upon this evaluation, the IDHW and the Coeur d'Alene Tribe jointly issued a fish consumption advisory in June 2003. The advisory was issued because study results detected lead, mercury, and arsenic at levels that may affect some people's health if they eat more fish than recommended. The developing bodies of small children can more easily absorb lead, mercury, and arsenic, and mothers can pass these elements to their children while pregnant or through nursing. The notice advises pregnant women, breastfeeding mothers, children under six years old, and members of the general public to limit the number of kokanee, bullhead, and bass they eat from Coeur d'Alene Lake. For bullhead, all people are advised to eat fillets rather than gutted, whole fish. The advisory also noted that by following the consumption limits in the advisory, the public can continue to enjoy the health benefits from a diet that includes fish caught from Coeur d'Alene Lake. The advisory is posted at boat launches and other locations on Coeur d'Alene Lake. Information about the specifics of the fish advisory is available on the IDHW web page (www.healthandwelfare.idaho.gov).

### *Technical Assessment of Coeur d'Alene Lake Fish Investigation*

Per USEPA guidance (USEPA, 2001e), technical assessment of the Coeur d'Alene Lake Fish Investigation was conducted by evaluating the following three questions related to protectiveness of the implemented actions:

#### *Question A: Is the remedy functioning as intended by the decision documents?*

The Coeur d'Alene Lake fish investigation was conducted as intended by the decision documents. The data gap identified in the HHRA (USEPA, 2001d) and the 2002 OU3 ROD has been addressed via the Coeur d'Alene Lake fish investigation, which was collaboratively developed and implemented in accordance with the 2002 OU3 ROD. As a result of the fish investigation, the IDHW and Coeur d'Alene Tribe jointly issued a fish consumption advisory for Coeur d'Alene Lake in 2003. Visitors to the lake may safely consume the fish they catch by following the fish advisory. While there are recommendations to limit consumption of some fish species and gutted whole fish for some consumers, in many cases the fish consumption advisory level is above what many people would normally consume. Additional monitoring of fish tissue metals levels is not planned at this time but will be conducted as part of the monitoring program under the revised Coeur d'Alene Lake Management Plan (LMP) (see Section 5.7.1).

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

The exposure assumptions, toxicity data, and other parameters used at the time of remedy selection remain valid for the Coeur d'Alene Lake fish investigation. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs and new or revised standards that have been issued since 2002.

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

This five-year review did not find any new information that calls into question the protectiveness of the Coeur d'Alene Lake fish investigation.

### *Remedy Issues*

**Table 5-29. Summary of Coeur d'Alene Lake Fish Investigation Issues**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| None | -- | – |

### *Recommendations*

**Table 5-30. Summary of Coeur d'Alene Lake Fish Investigation Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Future Sampling:** Evaluate the need for additional fish tissue sampling and testing in Coeur d'Alene Lake to assess the applicability of the current fish consumption advisory. | Coeur d'Alene Tribe, State of Idaho | Coeur d'Alene Tribe, State of Idaho | 9/2010 | N | Y |

### 5.5.1.11 OU3 Recreational Areas

#### *Review of ROD Requirements*

Section 12.1 of the 2002 OU3 ROD includes remediation of Lower Basin recreational areas to reduce human exposure to lead and other metals. Formal recreational areas, such as boat launches, picnic areas, and campgrounds, with surface soil containing concentrations greater than 700 mg/kg lead and 100 mg/kg arsenic will be remediated (USEPA, 2002a). Thirty-one recreational areas were identified in Figure 12.1-2 of the 2002

OU3 ROD with the recognition that other recreational sites may be evaluated for cleanup based on factors such as risk of exposure, location, and use. Other areas that may be evaluated include, but are not limited to, new recreational areas that may develop in conjunction with the recently opened Trail of the Coeur d'Alenes.

### Background

To identify and prioritize recreational areas for remediation under the 2002 OU3 ROD, the USEPA worked with the Basin Commission's Recreational Areas PFT. The Recreational Areas PFT is comprised of TLG and CCC members. The following principles were identified by the Recreational Area PFT for identification and prioritization of recreational areas for inclusion in the one-year and five-year cleanup plans and to guide remedial design work:

- Protect human health, particularly young children (primary objective);
- Design to minimize long-term O&M costs and repository requirements;
- Create clean oases for public use (based upon community interests);
- "Reality check" the scale and scope of what can be done (e.g., potable water, septic systems, etc.);
- Build upon existing features to enhance use and reduce risks to human health;
- Provide enough amenities to attract folks to clean "safe" areas but do not create attractive nuisances or beautification-only projects; and
- Design individual recreational areas to be consistent with an overall strategy for Basin recreational areas.

The above criteria were used to identify areas for inclusion in the Basin Commission's one-year and five-year work plans. The PFT conducted an evaluation of recreational areas identified in the 2002 OU3 ROD and other areas identified via a comprehensive inventory of recreational areas conducted by the USEPA and the USACE (USEPA, 2003c). The Recreational Area PFT developed a two-stage approach for the Commission's five-year work plan to address recreational areas in the Lower Coeur d'Alene Basin. The Basin Commission approved this approach in May 2003 (Basin Commission, 2003a).

*Stage 1 - Recreational Sites Identified for Active Remediation and Informational Signage*

The first stage is active remediation at six recreational areas selected from those identified in the 2002 OU3 ROD and subsequent common-use area evaluation by the Recreational Area PFT (USEPA, 2003c). Table 5-31 lists the six areas. The areas targeted for remediation are consistent with the above criteria, are on publicly owned property, and are good candidates for low-maintenance remedies that will be protective of human health. Many recreational areas were not selected for active remediation due to high recontamination potential, private ownership, and/or access concerns. Areas that are privately owned are not included because the intent is to establish publicly accessible recreational areas. The USEPA can use its CERCLA funding to remediate state, county, or local government-owned recreational properties; CERCLA funds cannot be used for sites on federal land managed by the USFS and the BLM.

**Table 5-31. Recreational Areas - Active Remediation (Excerpt from Basin Commission February 2003)**

| ID[1] | Site Name | Owner | Proposed Actions |
|---|---|---|---|
| 47 | Rainy Hill Boat Launch | USFS | • Recommend that USFS consider paving existing boat launch parking area and establish paved picnic site near restrooms on north side of site<br>• Continue day use only limitation |
| 44/45 | Medimont Boat Launch Area | USFS | • Recommend that USFS consider paving existing boat launch parking area and establish paved picnic site near restrooms on north side of site<br>• Continue day use only limitation<br>• Bank stabilization issues need to be addressed<br>• Consider establishment of overnight RV parking area (similar to the BLM's Killarney Lake Rec Area) |
| 59/60 | East of Rose Creek/West of Rose Lake | USFS | • Recommend USFS consider restricting access to contaminated dune area and to install sign visible from river (current sign visible from road only) |
| 46A | Rainy Hill Camping Area (on uncontaminated hill) | USFS | • Recommend USFS evaluate establishment of a camping area consistent with a Lower Basin Recreation Plan (if developed) |
| 33 | Anderson Lake Boat Launch | IDFG | • Consider improvements in conjunction with Hwy 97 bridge replacement (scheduled for 2005) and development of Lower Basin Recreational Area Plan |
| NA | Thompson Lake Boat Launch | IDFG | • Consider improvements to site to make it more attractive to users |

[1] "ID" indicates the common-use area identification number (USEPA, 2003c).

There are numerous publicly owned beach areas in the Lower Basin that have recreational use but were not selected as candidates for active remediation. The beaches along the Coeur d'Alene River pose special challenges for remediation because of the high likelihood of flooding and recontamination. For these beach areas, an "Information and Education" program was recommended by the TLG and approved by the Basin Commission to inform the Lower Basin recreational users of area risks and safe-use practices (e.g., washing hands before eating, not eating off of the ground, etc.). In the five-year work plan, the Basin Commission encourages a balance between sign-overload and advising prospective users of risks from exposure to lead in the soil (Basin Commission, 2003b).

*Stage 2 – Future Actions*

For the latter years of the five-year plan, the TLG recommended that the Basin Commission encourage development of a Lower Basin recreational management plan/policy (Basin Commission, 2003b). Many agencies and entities, including the BLM, the IDFG, the Coeur d'Alene Tribe, the Idaho Department of Parks and Recreation (IDPR), the USFS, the PHD and counties, manage recreational sites in the Lower Basin. These entities may benefit from the establishment of a coordinated plan to administer recreational areas. This effort could include development of collaborative informational/educational strategies regarding the Basin and Coeur d'Alene Lake. The plan could also address development of cooperative maintenance agreements.

Additional candidate areas for remedial action may be evident once the use patterns of the Trail of the Coeur d'Alenes are established.

### *Remedial Actions*

Under the 2002 OU3 ROD, two Lower Basin recreational areas were remediated in 2003-2004 (Basin Commission, 2003b). Based upon a review of the inventory, the above selection criteria, and area visits by the Recreational Area PFT, the East of Rose Lake Boat Launch and Highway 3/Trail of the Coeur d'Alenes Crossing were given a high priority for remediation by the Recreational Area PFT. Both projects were approved by the Basin Commission in May 2003. The goal for both areas was to reduce human exposure to lead- and arsenic-contaminated soil/sediment and build upon an existing recreational facility to create a clean oasis for recreational use. The Recreational Area PFT and CCC were involved in scoping of the design alternatives for both sites, and review of 30 percent and 95 percent designs. A community meeting was held on May 28, 2004, to share 30 percent (conceptual) designs with interested community members.

#### *East of Rose Lake Boat Launch Remedial Action*

The East of Rose Lake Boat Launch is located adjacent to Highway 3 and is primarily owned by the IDFG, with the eastern part of the property owned by the USFS. The area had a dusty, unpaved parking lot with high levels of metals. Average lead concentrations were in excess of 3,500 mg/kg in the soil/sediment, which posed a health risk to humans, especially young children. The key project goal was to reduce human exposure to lead- and arsenic- contaminated soil/sediment and build upon an existing recreational facility to create a clean oasis for public use. The USEPA is the project lead and due to joint ownership issues, the USEPA funded cleanup on the IDFG property and the USFS funded actions on their property. The USACE, under an Interagency Agreement with the USEPA, completed the design and managed the construction.

The remedial action included the following components:

- Capped contaminated soil in the parking lot to accommodate vehicle/trailer parking and constructed a low-water access boat launch;
- Graded parking lot so majority of the runoff is directed away from river;
- Performed bank stabilization near the boat launch to reduce erosion and human exposure to the contaminated riverbank. A vegetated rock toe wall with some large boulders a few feet away from the previously eroding bank was installed. Downstream of the boat ramp, the slope is graded to the rock base and vegetated with native plants. Upstream of the boat ramp, the rock base grades into layers of synthetic fabric with engineered fill to create a vegetated self, supporting steep slope;
- Closed off the Highway 3 access, replaced with a safer access off East River Road, and paved road from Highway 3 to new parking lot access;
- Closed off informal access road on the USFS property with boulders and planted with native vegetation;

- Installed a protective fence around the historic pioneer schoolhouse located on the property; and
- Monitored to assess effectiveness of remedial action.

*Highway 3/Trail of the Coeur d'Alenes Crossing Remedial Action*

The Highway 3/ Trail of the Coeur d'Alenes Crossing area is owned entirely by the IDFG. The project is adjacent to Highway 3 and builds upon an existing and well used access point to the Trail of the Coeur d'Alenes. This area was partially remediated in 2002 by the USEPA in the "Highway 3 Overpass" removal action (see Section 5.4.4.). Outside of the area capped under the removal action, there was dusty soil with average lead concentrations in excess of 4,000 mg/kg.

The remedial action included the following components:

- Capped contaminated soil adjacent to an existing parking lot which was capped under the 2002 removal action. Capped with a combination of pavement and a topsoil/fabric/grass that will block exposure to contaminated soil and create a safe picnic area for trail users;
- Planted trees to block view from downstream bald eagle nest; and
- Monitored to assess effectiveness of remedial action.

The USEPA funded the Superfund remedial action and the IDFG provided an informational kiosk and picnic tables. The USACE, under an Interagency Agreement with the USEPA, completed the design and managed the construction.

*Informational Health Warning Sign Installations*

As noted above, due to the potential for flooding and recontamination at Coeur d'Alene River beaches, these areas are not good candidates for active remediation. The Basin Commission approved installation of health warnings at nine locations as recommended by the Recreational Areas PFT and TLG (Basin Commission, 2003a and 2003b). The USEPA was the lead agency for this work. During the summer/fall 2004, informational signs similar to those already posted at selected locations in the Lower Basin were installed by the USACE under an Interagency Agreement with the USEPA at the following approved locations:

- Thompson Lake Boat Launch - Blue Lake (north side of river),
- River Mile 145,
- Lane Beach,
- Near east end of Killarney Lake,
- Black Rock Gulch Beach,
- Quarry Beach,
- East end of Black Rock Gulch Marsh,
- Upstream of entrance to Rainy Hill River access (south side of river), and
- South of Mission Flats.

*Thompson Lake Boat Launch*

As discussed in Section 5.4.6, this IDFG facility was the subject of a previous removal action. The site was included in the Basin Commission's five-year work plan to ensure that any additional remedial action needs would be met. Based upon a recent review of the status and condition of the IDFG Thompson Lake Boat Launch, the Recreational Area PFT determined that the site remedy is functioning as intended and that no additional action is warranted at this time. This decision was approved by the Basin Commission.

*Anderson Lake Boat Launch*

As discussed in Section 5.4.7, this IDFG facility was the subject of a previous removal action. The site was included in the Basin Commission's five-year work plan to ensure that any additional remedial action needs would be met. The Idaho Highway 97 bridge across the Coeur d'Alene River is immediately downstream of the boat launch. The Idaho Transportation Department is in the planning and design phase for replacement of this bridge. The new bridge will be considerably wider, and bridge access will be adjusted accordingly, which may in turn impact the Anderson Lake Boat Launch access point. The USEPA is deferring any additional remedial action work at the Anderson Lake Boat Launch so that further efforts can be coordinated with the bridge replacement. The USEPA arranged a visit by the Recreational Area PFT to the site in March 2004 with Idaho Department of Transportation (IDT) representatives and will continue to stay abreast of plans for bridge replacement.

### *Technical Assessment of Lower Basin Recreational Area Remedial Actions*

Per USEPA guidance (USEPA, 2001e), technical assessment of the Lower Basin Recreational Area remedial actions were conducted by evaluating the following three questions related to protectiveness of the implemented actions:

***Question A: Are the remedies functioning as intended by the decision documents?***

The remedies are functioning as intended by the decision documents. Specific aspects of the remedy performance evaluation are described below.

RAs at both the East of Rose Lake Boat Launch and Highway 3/Trail of the Coeur d'Alenes Crossing sites were completed in early summer 2004 (USACE, 2004c). Both facilities are open for public use and safe enjoyment. The East of Rose Lake Boat Launch has received very favorable reviews from local citizens and media. The plantings at both were watered via a water truck during the dry season to ensure a good first season of growth to establish the vegetation. The informational signs are in place and functioning as intended.

As noted above, both sites will have RA effectiveness monitoring to assess the status and effectiveness of the implemented remedies. The monitoring will include assessment of vegetative cover twice annually, annual evaluation of the East of Rose Lake bank stabilization, and an annual transit of the river channel at the East of Rose Lake site. A significant flood event will trigger additional monitoring soon after the high water event.

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the both the East of Rose Lake Boat Launch and Highway 3/Trail of the Coeur d'Alenes Crossing sites remedial actions. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

This five-year review did not find any new information that calls into question the protectiveness of the East of Rose Lake Boat Launch and Highway 3/Trail of the Coeur d'Alenes Crossing sites remedial actions or installation of informational signage.

### Remedy Issues

**Table 5-32. Summary of Lower Basin Recreational Area Issues**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| None | -- | – |

### Recommendations

**Table 5-33. Summary of Lower Basin Recreational Area Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Remedial Action Effectiveness Monitoring**: Implement remedial action effectiveness monitoring programs at the East of Rose Lake Boat Launch and the Highway 3/Trail of the Coeur d'Alenes Crossing sites. | USEPA | USEPA | Ongoing | N | N |
| **East of Rose Lake Boat Launch:** Continue remedial action effectiveness monitoring. | USEPA | USEPA | 9/2010 | N | Y |
| **Highway 3/Trail of the Coeur d'Alenes**: Continue remedial action effectiveness monitoring. | USEPA | USEPA | 9/2010 | N | Y |
| **Informational Signage:** Replace damaged signs as needed. | USEPA | USEPA | Ongoing | N | N |
| **Additional Areas:** Identify and evaluate additional Lower Basin recreational areas that may require cleanup. | USEPA | USEPA | Ongoing | N | N |

### 5.5.2. Ecological Evaluations

The OU3 Ecological Risk Assessment noted that songbirds in riparian areas were at high risk of lead exposure and effects (USEPA, 2001f) and that site-specific exposure data for songbirds were not available. To address this data gap, the USEPA established an Interagency Agreement with the USFWS to conduct an ecological evaluation of exposure and effects of lead-contaminated soils on migratory birds.

#### 5.5.2.1 Evaluation of Migratory Birds in Riparian and Riverine Habitats

The songbird study was conducted to provide site-specific data for incorporation into a risk analysis to determine if songbirds are at risk of lead exposure and to determine the lead concentrations in soil associated with potential adverse effects. The study was conducted on migratory birds in riparian and riverine habitats to evaluate the exposure and potential effects of lead-contaminated soils on ground-feeding songbirds. Ground-feeding songbirds (e.g., American robin [*Turdus migratorius*], song sparrow [*Melospiza melodia*], and Swainson's thrush [*Catharus ustulatus*]) spend much of the spring and early summer feeding on invertebrates in and on the ground. Consequently, their feeding activity may allow or promote the ingestion of soil, which in some areas of the Coeur d'Alene River Basin contains high concentrations of lead. Ingestion of lead-contaminated sediment has already been shown to cause mortality and other toxic effects in waterfowl inhabiting the basin (Blus et al., 1999; Beyer et al., 2000; Henny et al., 2000; Sileo et al., 2001). Data presented here are preliminary. Additional samples not presented here were collected in 2004 and analytical results are not yet available. Data from 2004 sampling will be incorporated when available, and these results may affect data interpretation and statements of significant results. A final report of this study is expected in 2005.

##### *Description of Study Methods*

The study was designed to collect several types of samples, including:

- Songbird blood for lead, hematocrit, and delta-aminolevulinate acid dehydratase (ALAD) activity;
- Songbird liver for lead;
- Songbird stomach contents (ingesta) for lead and aluminum;
- Field-collected invertebrates for lead and aluminum; and
- Soil for lead and aluminum.

Songbird blood and liver samples were collected to determine potential exposure and effects, while ingesta, invertebrates, and soil were collected to determine pathway from soil to bird. Aluminum was used as a marker for soil ingestion and percent soil in food items (Beyer et al., 1999).

Samples were collected at several locations including:

- Little North Fork Coeur d'Alene River (reference area);
- Springston;
- Cataldo;

- Strobl;
- Osburn (2004 samples, data analysis not available);
- Moon Gulch;
- Pine Creek; and
- Tributary Creek (below Jack Waite Mine) in the North Fork Coeur d'Alene River Basin.

Samples were collected using established techniques. Songbirds were captured in mist nets which were placed in areas typically used by the target species (American robin, Swainson's thrush, song sparrow). Blood samples were collected from the jugular vein of the songbirds using a modified technique shown in this study to not cause high mortality. Liver and ingesta samples were collected by dissection from a subset of birds at each location. Invertebrates were collected opportunistically from areas near where birds were captured. Soil samples were collected as composites of five subsamples from five of the mist net sites at each capture location. The five subsamples were soil collections from 0 to 2 inches in depth from the center of the net, and from 10 meters in each quadrant from that center point.

### *Summary of Results*

Results are presented as individual parameter results and then summarized in interpretive conclusions.

#### *Soil Lead Concentrations*

Reference soils (Little North Fork Coeur d'Alene River had mean (sd, n) lead concentration 24.6 (29.0, 5) mg/kg dry weight (dw). Assessment soils ranged from 1,136 (859, 5) mg/kg (dw) at Springston to 4,155 (4146, 5) at Strobl (Figure 5-6).

#### *Blood lead Concentrations*

Most reference birds contained blood lead concentrations that were less than detection limits (Figure 5-7).

American robin from the reference area contained a mean blood lead of 0.05 mg/kg wet weight (ww) compared to the mean detection limit for blood lead of 0.037 mg/kg (ww).

Song sparrows contained significantly elevated blood lead concentrations at all assessment locations where this species was captured, including the assessment location with the lowest soil lead concentration (Springston: 1,136 mg/kg (dw) soil lead).

Swainson's thrush contained significantly elevated blood lead concentrations at locations containing 1,297 to 2,030 mg/kg (dw) in soil. This species was not found in assessment areas containing higher soil lead concentrations.

American robin contained significantly elevated blood lead at locations with mean soil lead concentrations of 2,353 and 4,155 mg/kg (dw). Non-significant blood lead concentrations were found at other locations, but sample sizes were low (n=1 or 2).

#### *Blood ALAD Activity*

Delta-aminolevulinic acid dehydratase (ALAD) is an enzyme necessary for the production of heme (Pain, 1996). Heme is a component of hemoglobin and mitochondrial

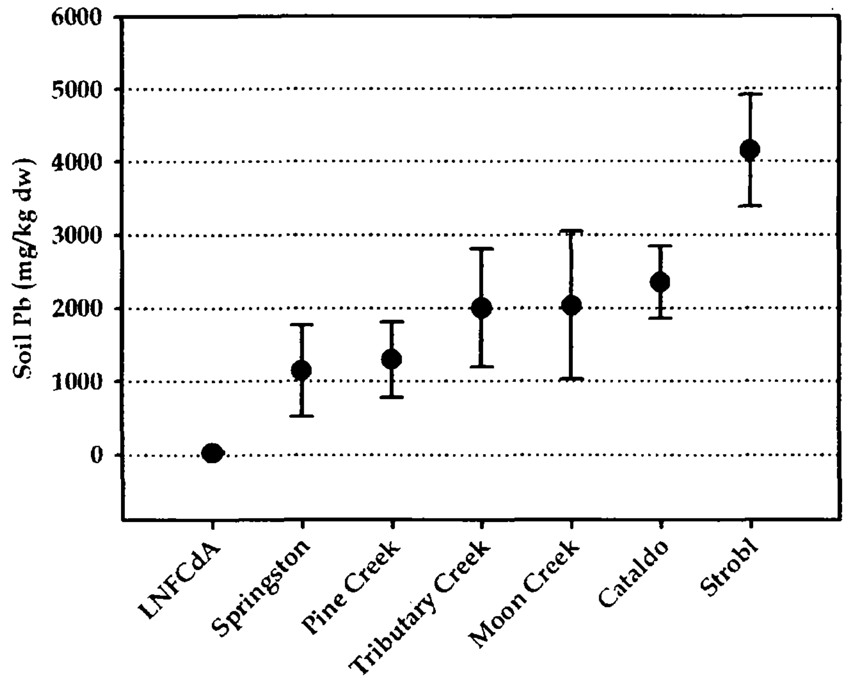



**Figure 5-6. Plot of mean (±1 standard deviation) soil Pb concentration (mg/kg dw) at each of the locations sampled**

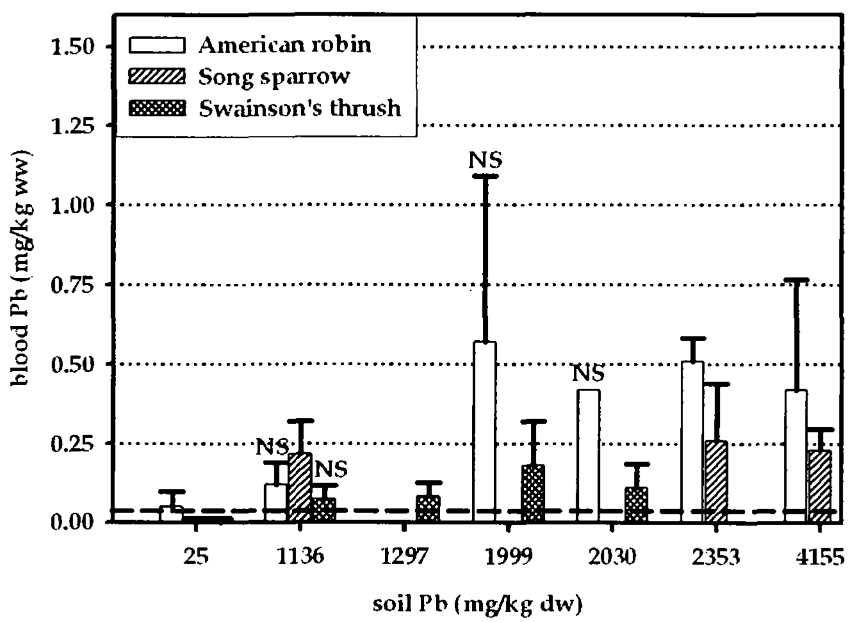



**Figure 5-7. Plot of mean (+ 1 standard deviation) of blood Pb concentrations (mg/kg wet wt.) for each species captured at each location.** "NS" indicates data that were not significant from the reference location. The dashed horizontal line indicates the mean detection limit for blood Pb.

cytochromes. Lead is known to inhibit ALAD enzyme activity, and reduced ALAD is a sensitive biomarker of lead exposure (Hoffman et al., 2000). A 50 percent ALAD inhibition is defined as an injury under Department of the Interior (DOI) regulations.[5]

Significant ALAD inhibition (mean greater than 50 percent) was found in song sparrows from the lowest soil lead location (1,136 mg/kg (dw)) and all higher soil lead locations where the species was captured (Figure 5-8).

Significant ALAD inhibition was found in Swainson's thrush at locations with mean soil lead of 1,297 mg/kg (dw) and above (at locations where the species was captured).

Significant ALAD inhibition was found in American robin at locations with mean soil lead of 1,999 mg/kg (dw) and above.

Greater than 50 percent ALAD inhibition was observed in all individuals of each species when blood lead was greater than 0.25 mg/kg (ww) (Figure 5-9).

*Liver Lead Concentrations*

Liver lead concentrations were higher in song sparrow than in the other species at each sampling location. Regression analysis conducted through the data indicates song sparrow show approximately 2 mg lead/kg (ww) in liver at locations with soil concentrations of 1,000 mg lead/kg (dw), and approximately 6 mg lead/kg (ww) in liver at locations with soil concentrations of 3,000 mg lead/kg (dw).

*Lead Pathway*

Aluminum in ingesta and invertebrate samples was used as a marker of soil in the sample. Aluminum concentrations are relatively high in soil samples, and aluminum is relatively undigestible (Beyer et al., 1999). For both ingesta and invertebrate sample evaluation, the sample lead concentration was predicted based on the aluminum in the sample and the ratio of soil aluminum to soil lead. This predicted lead in the sample is the lead concentration in the sample if all the lead in the sample is from soil.

Regression of $\log_{10}$ of observed lead to the $\log_{10}$ of predicted lead in ingesta had a slope of 0.90 ($r^2 = 0.64$) indicating that most of the observed lead in the ingesta sample was from soil ingestion.

Regression of $\log_{10}$ of observed lead to the $\log_{10}$ of predicted lead in invertebrate samples had a slope of 0.99 ($r^2 = 0.68$) indicating that most of the observed lead in the field-collected invertebrates (food items) was from soil in the samples.

Mean (sd, n) soil ingestion rate for song sparrow was 15.5 percent (15.5 percent, 11), for American robin was 5.2 percent (5.3 percent, 7), for Swainson's thrush was 0.6 percent (0.3 percent, 12).

### Data Interpretation

*Blood Lead*

Subclinical effects have previously been determined in some bird species with greater than 0.2 mg lead/kg (ww) in blood (Franson, 1996). The present study identified that

[5] 43 CFR 11.62 (f)(4)(v)(D)

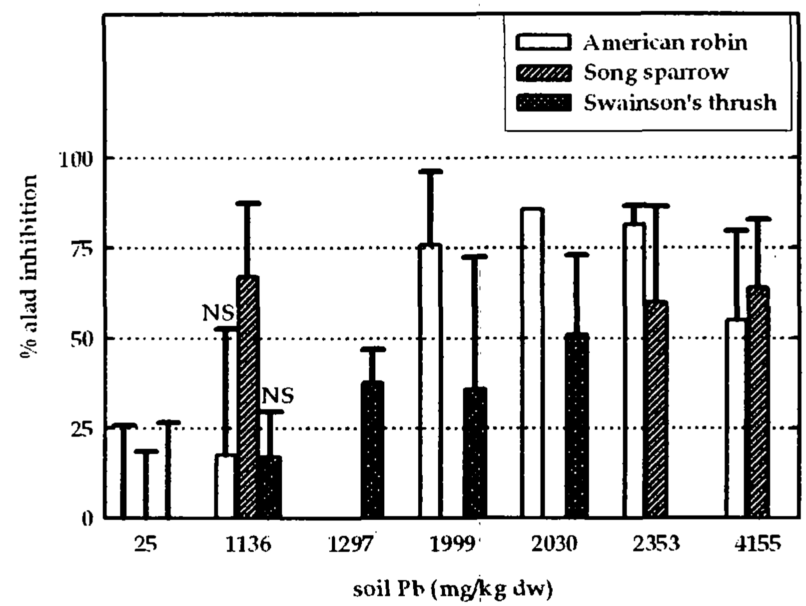



**Figure 5-8. Plot of mean (+ 1 standard deviation) of blood ALAD (delta-aminolevulinate dehydratase) activity inhibition for each species at each sampled location.** "NS" indicates data that were not significant from the reference location.

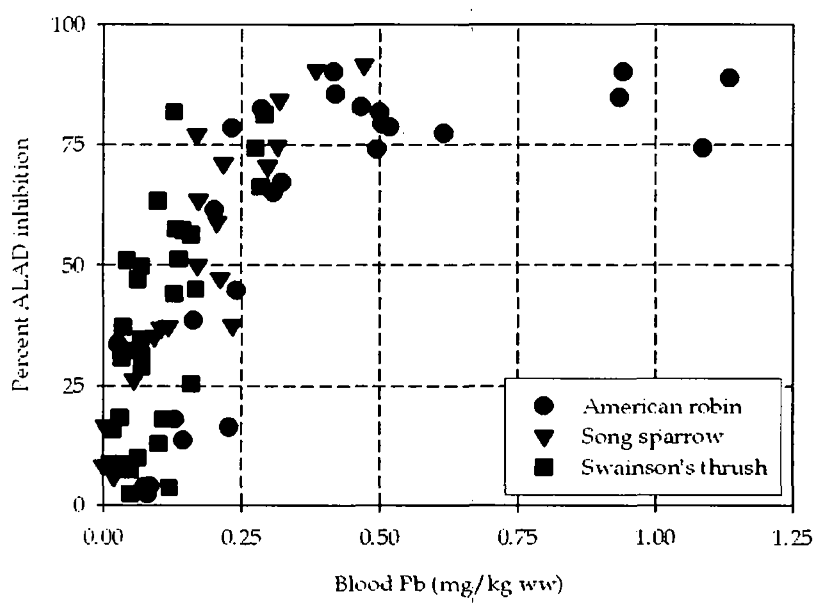



**Figure 5-9. Plot of percent ALAD inhibition as a function of blood Pb (mg/kg ww).** Points are individual bird measurements.

song sparrows inhabiting areas with 1136 mg/kg (dw) lead and greater in soil contained, on average, greater than 0.2 mg lead/kg (ww) in blood.

*Blood ALAD*

Greater than 50 percent ALAD inhibition is considered an injury to mammals and birds.[6] The present study identified that song sparrows inhabiting areas with 1136 mg/kg (dw) lead and greater in soil contained, on average, greater than 50 percent ALAD inhibition.

*Liver Lead*

Subclinical effects have previously been observed in some bird species when liver concentrations of lead exceed 2 mg/kg (ww), and clinical effects have been observed when liver concentrations of lead exceed 6 mg/kg (ww) (Franson, 1996). Regression analysis would predict song sparrows to have an average of 2 mg/kg (ww) liver lead when exposed to soil containing 1,000 mg lead/kg (dw). Song sparrows are predicted to have an average of 6 mg/kg (ww) in liver when exposed to soil containing 3,000 mg lead/kg (dw). Some 33 percent of song sparrows collected contained livers exceeding 6 mg/kg (ww) in areas containing 2,353 mg lead/kg (dw) in soil, and 80 percent of song sparrows collected contained livers exceeding 6 mg/kg (ww) in areas containing 4,155 mg lead/kg (dw) in soil.

*Pathway*

The primary pathway for lead exposure in songbirds is soil ingestion, similar to the pathway for waterfowl (Beyer et al., 2000). Average soil ingestion rates were highest for song sparrow. Song sparrow mean soil ingestion rate was three times higher than American robin, and 24 times higher than Swainson's thrush.

#### Conclusions

Song sparrows were the most sensitive species evaluated. This species contained more than 0.2 mg lead/kg (ww) in blood, more than 2 mg lead/kg (ww) in liver, and more than 50 percent ALAD inhibition in areas containing greater than 1,100 mg/kg (dw) in soil.

The greater sensitivity of song sparrow may be related to higher soil ingestion rates.

Although more sensitive, song sparrows were not observed to have greater than 0.58 mg lead/kg (ww) in blood.

Potential adverse effects of soil lead concentrations less than 1,100 mg/kg (dw) are not known.

### 5.5.2.2 Technical Assessment of Migratory Bird Study

Per USEPA guidance (USEPA, 2001e), technical assessment of the Migratory Bird Study was conducted by evaluating the following three questions related to protectiveness of the implemented actions:

[6] 43 CFR 11.62

### *Question A: Is the remedy functioning as intended by the decision documents?*

The migratory songbird study was conducted in accordance with the 2002 OU3 ROD decision documents.

### *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?*

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the migratory songbird study. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

### *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

This five-year review did not find any new information that calls into question the applicability or relevance of the migratory songbird study.

### *Remedy Issues*

**Table 5-34. Summary of Migratory Songbird Study Issues**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **Data Gaps:** Did not assess areas with soil concentrations less than 1,100 mg/kg (dw) and so potential adverse effects on songbirds is not known when the songbirds are inhabiting areas with soil lead less than 1,100 mg/kg (dw). | N | N |
| **Sub-lethal Effects:** Impact of sub-lethal effects on songbirds is unclear. | N | N |
| **Population-level Impacts**: Did not assess potential population-level impacts, particularly at areas where might expect clinical effects on individual songbirds (e.g., Cataldo, Strobl based on liver lead concentrations in song sparrows). | N | N |

### *Recommendations*

**Table 5-35. Summary of Migratory Songbird Study Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Risk Analysis:** Conduct a risk analysis with data generated from the migratory songbird study, and assess any data gaps identified. | USEPA | USEPA | 9/2010 | N | Y |

| Table 5-35. Summary of Migratory Songbird Study Recommendations and Follow-Up Actions | | | | | |
|---|---|---|---|---|---|
| | | | | Follow-up Actions: Affects Protectiveness (Y/N) | |
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Current (now to 1 year) | Future (>1 year) |
| **Survey and MAPS:** Continue the Breeding Bird Survey and MAPS route through the Lower Coeur d'Alene River Basin to determine bird diversity. Assist managers in riparian habitat remedial decisions. | USEPA | USEPA | Ongoing | N | Y |

## 5.5.3 Review of Treatability Studies

### 5.5.3.1 Canyon Creek Water Treatment Pilot Project

#### *Overview*

The 2002 OU3 ROD selected a remedy that set performance goals for surface water treatment in Canyon Creek and a focus on identifying cost-effective technologies for improving downstream water quality in the SFCDR. The location of the Canyon Creek watershed is shown in 2002 OU3 ROD Figure 12.2-9.

To reduce zinc loads to the SFCDR, the 2002 OU3 ROD calls for a 50 percent reduction in surface water dissolved metals (see Table 12-2-1 of the OU3 ROD) at the mouth of Canyon Creek. The Canyon Creek Treatability Study represents the first step to evaluate water treatment options for Canyon Creek. This work is intended to lead to treatment technologies that meet the Canyon Creek water treatment goals. A variety of technologies and approaches, including the use of passive techniques, is being evaluated and critiqued by the USEPA. Input from the Basin Commission Water Treatment PFT will be sought during this review and critique process as well as information generated from other water treatment projects conducted within Canyon Creek and the overall basin.

#### *Background*

Because conventional active treatment appeared cost-prohibitive, the 2002 OU3 ROD identified a passive treatment (p. 12-25) that appeared to meet the treatment goals but at a lower total cost than conventional active treatment. As illustrated by the conceptual drawing of 2002 OU3 ROD Figure 12.2-7, the passive treatment for Canyon Creek was represented by an innovative treatment-pond system. The treatment pond covered a several-acre site hypothetically located downstream of the Star Hecla tailings ponds in the floodplain of Canyon Creek.

The treatment pond was discussed in the OU3 FS (USEPA, 2001b, Part II, Ecological Alternative 3). A mathematical model for quantitatively estimating the potential zinc-removal performance of the treatment pond was developed and documented in an FS technical memorandum (URS, 2001). The pond model was later used to make zinc load reduction estimates for the 2002 OU3 ROD, as discussed in the next paragraph.

Table 5-36 summarizes the yearly average treatment reductions of dissolved zinc load assumed in the 2002 OU3 ROD: 322 pounds per day for Canyon Creek, an approximately 63 percent reduction from recent historical averages; and 50 pounds per day for East Fork Ninemile Creek, an approximately 23 percent reduction from recent historical averages. The assumed load reductions were based on the analysis documented in the OU3 FS (USEPA, 2001c). As explained in the FS, the 322 pounds per day for Canyon Creek was a probabilistic expected value that reflected an 80 percent confidence interval estimate of 252 to 425 pounds per day (45 to 76 percent reduction) for the range of conditions considered in the analysis.

**Table 5-36. OU3 ROD Selected Remedy Water Treatment Zinc Load Reduction**

| Treatment Location | Zinc Load Reduction (lb/day) | Reduction from Average Historic Load (%) |
|---|---|---|
| Canyon Creek | 322 | 63 |
| East Fork Ninemile | 50 | 23 |

The various performance and siting concerns associated with the pond treatment were recognized during development of the 2002 OU3 ROD. These concerns included siting and performance issues associated with the large area of the ponds and consequently limited availability of suitable sites in lower Canyon Creek. It was recognized that an ideal treatment site for reducing loads would allow diverting flow increments from the creek mouth, by which point virtually the entire groundwater load from the up-valley aquifer has entered the creek. Other technical concerns included the uncertain treatment effectiveness and efficiency due to variable and high flow rates, potential short-circuiting and clogging of treatment media, variable media capacity and effective life, and an uncertain level of necessary O&M.

Recognizing these concerns, the 2002 OU3 ROD acknowledged that the exact nature of the treatment had yet to be determined and could include "active technology components." The ROD called for implementing the water treatment based on the outcome of a "demonstration project for treatment of creek water and groundwater near the mouth."[7] The ROD also stated (pp. 12-25, 26) that "if passive treatment does not prove effective, alternative treatment and control systems to achieve the benchmark of a least 50 percent reduction of dissolved metal loads would be evaluated."

Since the 2002 OU3 ROD was signed, evaluations conducted by the USEPA identified concerns about the ability of a passive treatment, as envisioned in the ROD, to fully meet the ROD goals for Canyon Creek (URS, 2003) . Further support for these concerns has resulted from the Success Mine Site apatite-based passive treatment (see Section 5.4.3), which appears to have performed much less effectively than originally expected. While the alternative—active treatment—was included in the OU3 FS, it was not explicitly chosen in the ROD because of cost considerations. The Canyon Creek Treatability Study provides information to demonstrate and evaluate the potential effectiveness of conventional and innovative treatment processes for Canyon Creek.

[7] The 2002 OU3 ROD Table 12.2-1 states: "Pilot and demonstration projects for treatment of creek water and groundwater near the mouth (permeable reactive barrier (PRB) or other technology, potentially including active technology components). Implement water treatment or other technology based on outcome of demonstration project."

### *Treatability Study*

The Canyon Creek Treatability Study was divided into two phases. Phase I of the study has been completed and focused on the identification and evaluation of existing conventional technologies potentially applicable to Canyon Creek conditions, and the performance of limited laboratory treatability testing to make recommendations for a Phase II effort.

The laboratory-scale treatability studies were conducted on both surface water and groundwater collected from Canyon Creek. The treatability study used a series of jar tests to evaluate the effectiveness of a variety of combinations of lime stabilization, iron coprecipitation, polymer flocculation, and ballasted-microsand separation technology. Lime stabilization was evaluated by varying the pH using a lime slurry. Iron coprecipitation was assessed by varying the dosage of ferric chloride and/or ferrous sulfate. Flocculant performance was assessed for cationic, nonionic, and anionic polymer products. Sludge produced during the jar tests was evaluated for settling rate, density, and filterability.

Several combinations of the approaches identified in the Phase I testing proved to be very effective with respect to total metal removal and achievement of water quality criteria. (URS, 2005) The optimum treatment parameters identified in the surface water and groundwater testing phases include pH adjustment by lime addition, coagulant addition for iron co-precipitation, and anionic flocculent and microsand addition for rapid solid-water separation. For optimum treatment average percent reductions for dissolved zinc, cadmium, and lead were similar and over 99 percent in both the surface water and groundwater phases: approximately 99.7 +/- 0.1 percent. Treated water had concentrations well below Ambient Water Quality Criteria (AWQC) (AWQC rations well below 1.0) for zinc and cadmium. If these optimum results could be scaled up, they would indicate that dissolved metals can be removed to essentially negligible levels in treated Canyon Creek surface water, groundwater, or combinations of both.

Phase II is expected to begin during fall 2005 and include a pilot field test of one or more of the active technologies identified in Phase I as well as further development and testing of other technologies and approaches, including aerobic or anaerobic passive technologies. This work will lead to the design and implementation of a technology, or combination of technologies, that could meet the Canyon Creek water treatment goals of the remedy.

#### Technical Assessment of Canyon Creek Treatability Study

Per USEPA guidance (USEPA, 2001e), technical assessment of the Canyon Creek Treatability Study was conducted by evaluating the following three questions related to protectiveness of the implemented actions:

### *Question A: Is the remedy functioning as intended by the decision documents?*

This remedy component has not yet been implemented by the USEPA.

### *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?*

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the treatment of water in Canyon Creek. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

### *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

This five-year review did not find any new information that calls into question the protectiveness of the remedial action planned for treatment of Canyon Creek water.

### *Remedy Issues*

**Table 5-37. Canyon Creek Water Treatment Issues**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **Treatment Technologies:** Need to identify treatment technologies that will meet the goals of the 2002 OU3 ROD at the lowest possible long term O&M cost. | Y | Y |

### *Recommendations*

**Table 5-38. Summary of Canyon Creek Water Treatment Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Treatment Technologies:** Complete pilot studies to evaluate active and passive technologies that can achieve the goals of the 2002 OU3 ROD. | USEPA | USEPA | Ongoing | Y | Y |

## 5.5.3.2 Agricultural to Wetland Conversion

### *Review of ROD Requirements*

Section 12.2.1 of the OU3 ROD identifies that a goal of the Selected Remedy is to increase the amount of safe waterfowl feeding areas by identifying and cleaning up some areas that are currently used for agriculture (USEPA, 2002a). These actions would be conducted in cooperation with the property owners. The 2002 OU3 ROD targets an estimated 1,500 acres for conversion from agricultural use to clean wetland habitat.

### Background

Soil and sediment throughout the floodplains of the Lower Basin are contaminated with lead that has washed downstream over the years from Upper Basin mining activities. Lead-contaminated sediments in the floodplains have caused adverse effects to waterfowl and other wildlife. Notably, waterfowl (e.g., tundra swans and ducks) ingest highly contaminated sediment to the extent that many have suffered toxic effects or died from ingestion of lead. Wetland habitats with lower soil/sediment lead concentrations need to be provided for wildlife in order to reduce mortality and ecological risk in the Coeur d'Alene Basin. Many privately owned agricultural and wetland areas exist which may provide remediation opportunities for creation of low-risk habitat for waterfowl and other wildlife. Creation and/or improvements of wetland habitat on private lands could be supported with financial incentives such as conservation easements for landowners. Conversion of agricultural land to wetland habitat via a conservation easement may be a cost-effective method to establish clean waterfowl feeding areas in areas of low recontamination potential.

In their prepublication report, the NRC "encourages the USEPA's efforts to secure agricultural lands, converting them to high-quality feeding grounds" (NRC, 2005, p. 288). The NRC report further notes that "reestablishing wetlands in these areas is a laudable effort, particularly if these areas are less susceptible to contamination from flooding" (NRC, 2005, p. 288).

### Technical Assessment of Agricultural to Wetland Conversion

Per USEPA guidance (USEPA, 2001e), technical assessment of the Agricultural Wetland Conversion was conducted by evaluating the following three questions related to protectiveness of the implemented actions:

#### Question A: Is the remedy functioning as intended by the decision documents?

This remedy component has not yet been implemented. The USEPA and others are determining if private property owners in the Lower Basin may be interested in wetland creation and/or enhancement on their property. Ducks Unlimited and USFWS are joint recipients of Basin Commission Clean Water Act Grant funding to inventory and evaluate private lands for potential restoration of wetland habitats. Willing landowners in the Coeur d'Alene Basin will be surveyed to determine interest in wetland creation or enhancement on their properties.

#### Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the future agricultural to wetland conversion projects. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

#### Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

This five-year review did not find any new information that calls into question the protectiveness of the agricultural to wetland conversion.

### Remedy Issues

| Table 5-39. Summary of Agricultural to Wetland Issues | | |
|---|---|---|
| Issues | Affects Protectiveness (Y/N) | |
| | Current (now to 1 year) | Future (>1 year) |
| **Identify Landowners**: Need to identify landowners interested in agricultural to wetland conversion | N | Y |

### Recommendations

| Table 5-40. Summary of Agricultural to Wetland Recommendations and Follow-Up Actions | | | | | |
|---|---|---|---|---|---|
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Identify Landowners:** Identify landowners interested in agricultural to wetland conversion | USEPA | USEPA | Ongoing | N | Y |

## 5.5.3.3 Soil Amendment Study

### Background and Descriptions

Waterfowl mortality due to lead poisoning associated with the ingestion of metal-contaminated sediments has been reported for decades in the Coeur d'Alene River Basin. Lead levels in sediment over broad areas of the Basin have been measured in thousands of milligrams/kilogram on a dry weight basis. Waterfowl sometimes consume large amounts of sediment in the course of feeding (Beyer et al., 1994), and since the early 1900s have been dying from lead poisoning along the Coeur d'Alene River (Chupp and Dalke, 1964; Benson et al., 1976; Blus et al., 1991; Beyer et al., 2000). Different treatment technologies, including soil amendments, have been proposed as an alternative to large-scale removals but need evaluation for effectiveness in reducing lead bioavailability to waterfowl. The focus of the soil amendment studies was to assess the effectiveness of phosphate-based soil amendments at reducing bioavailability of lead to waterfowl and the leachability of metals.

Study development involved many Coeur d'Alene Basin stakeholders, including the USEPA, the IDEQ, the USFWS, the Washington State Department of Ecology, the Coeur d'Alene Tribe, the Spokane Tribe, the USGS, and others. Representatives of the government/industry In-Place Inactivation and Natural Ecological Restoration Technologies (IINERT) Soil-Metals Action Team also provided technical input. Numerous other parties received e-mails providing them with information on the deliberations regarding the soil amendment studies and inviting their participation in the discussions. A Consensus Study Plan and a Data Quality Objectives document were developed by the stakeholder group to guide implementation of the soil amendment studies (USEPA, 2001g and 2001h).

The soil amendment investigations involved a two-pronged collaborative approach using both field and laboratory studies conducted by the IDEQ and the USFWS. The IDEQ component evaluated the effectiveness of phosphate-based soil amendments to reduce the leachability of heavy metals mining-impacted soils under field conditions. The predecessor to the current Basin Commission funded the leachability study. The USFWS conducted an in-vivo waterfowl feeding study to determine whether sediments amended with phosphoric acid would reduce the bioavailability of lead to waterfowl. Both lab- and field-amended soils were used in the feeding study. The USEPA funded the USFWS feeding study. Both the field and laboratory studies began March 2001.

### Methods

#### *Field Leachability Study*

The field leachability study was implemented by the IDEQ. In the study, four 20-foot by 20-foot plots were established at both Black Rock Slough and Bull Run Lake. Both of these areas are located in the floodplain of the Coeur d'Alene River and have sediment deposits that are contaminated with heavy metals from upstream mining operations. The plots at each site were subjected to the following applications:

- Amendment with fishbone apatite (ground fish bone);
- Amendment with liquid phosphate fertilizer (phosphoric acid), calcium carbonate, and KCl;
- Amendment with calcium carbonate/lime; and
- Control (not altered).

The soil and pore water or shallow groundwater was sampled by the IDEQ for 16 months to assess how the amendments affected the soil and pore water chemistry under field conditions. To further examine how and where contaminants are bound in the amended soil, sequential (or selective) chemical extraction techniques were performed on samples of both pre- and post-amended soils. For additional details regarding the field leachability study methodology, please refer to the IDEQ document titled *Data Summary Memorandum: Soil Amendment Studies at Bull Run and Black Rock Slough, Coeur d'Alene Basin* (IDEQ, 2003).

#### *Waterfowl Feeding Study*

The waterfowl feeding study was implemented by the USFWS under funding provided by the USEPA. In the study mallard ducks were randomized to each of eight different diets containing sediment from either the St. Joe River (a reference site) or one of three locations within the Coeur d'Alene River Basin. Contaminated sediment samples collected from Black Rock Slough, Bull Run Lake and Harrison Slough were used in the feeding study. To provide laboratory control, some of the sediment samples used in the feeding study were amended and aged in the Patuxent Wildlife Research Center laboratory under controlled conditions. Samples of soil amended in the field with phosphoric acid as part of the IDEQ leachability study were also shipped to the lab and included in the waterfowl feeding study. Sediment was amended with 1 percent phosphorus as phosphoric acid (liquid phosphate fertilizer) and other samples served as controls. Each waterfowl diet contained 12 percent sediment. After eight weeks on the experimental diets, a sample of blood was taken from each bird for lead analysis, and a sample of liver and kidney was saved from each bird for lead analysis. For additional detail regarding the waterfowl feeding methodology, please refer to Heinz et al. 2004.

### Results

#### Field Leachability Study

The IDEQ leachability study results suggest that addition of soil amendments causes chemical changes to occur which may affect the leachability of lead (IDEQ, 2003). The pore water analyses and soil leaching data indicate the following chemical changes:

- Phosphate amendments reduce the leaching of lead from soil by the toxicity characteristic leaching procedure (TCLP) extraction method;
- Because the lime did not completely neutralize the acidity of the phosphate amendment, a short-term increase in soluble cadmium and zinc pore water concentrations returned to pretreatment;
- The amendments caused a short-term increase in soluble arsenic in the treated soils. Arsenic concentrations in pore water returned to pretreatment levels; and
- Soluble phosphorus did not increase in soils treated with fishbone apatite but did show an increase in soils treated with liquid phosphate fertilizer, which appears to be decreasing with time. This may be related to the form in which the phosphate was added (e.g., liquid vs. solid).

Sequential chemical extraction analyses conducted on amended sediment suggest that the addition of phosphate-based amendments converted the lead, zinc, and cadmium to less soluble phases and more environmentally stable chemical forms (Strawn et al., 2002).

#### Waterfowl Feeding Study

The results of the USFWS feeding study demonstrated that the addition of 1 percent phosphorus to lead-contaminated sediments, whether applied in the lab or the field, reduced the bioavailability of lead to mallards (Heinz et al., 2004). Lead concentrations in mallard tissues, however, still exceeded concentrations understood to be harmful to waterfowl from previous work in the Basin (Beyer et al., 2000). Based upon the results of earlier studies of sediment toxicity to waterfowl in the Coeur d'Alene Basin and the results of this study, phosphoric acid might provide significant benefit to waterfowl in situations where sediment lead concentrations are less than 1,000 to 2,000 μg/kg lead. In highly contaminated areas, phosphorous amendments alone may not make the lead contaminated sediments safe for waterfowl.

The results of both the waterfowl feeding and leachability studies suggest that phosphate-based soil amendments may assist in reducing leachability and bioavailability of lead to waterfowl. However, further study is needed to resolve questions concerning optimal application rates, long-term stability, and potential seasonal effects.

### *Follow-up and Recommendations*

Follow-up work by Dr. Daniel Strawn, University of Idaho, is continuing under funding provided by the USEPA Office of Research and Development's Mine Waste Technology Program. Dr. Strawn is investigating metal speciation in both the amended and unamended soils. The results of these analyses are expected to provide information about the long-term stability of compounds formed by the addition of the phosphate-based soil amendments. Results from this work are expected to be available in late 2005.

To determine the practical limitations of phosphoric acid in reducing the threat of lead poisoning in waterfowl from ingestion of lead-contaminated sediments further tests will need to be conducted. Evaluation and assessment of any ecological risks associated with widespread application of phosphoric acid will be needed. For example, the effects on plant growth and water quality must be further understood prior to a broad-scale application. Practical considerations, such as practical large-scale application technique, also require further investigation. The addition of phosphorus to floodplain soils creates the potential for additional input of phosphorus to Coeur d'Alene Lake when overbank flooding occurs during high flow discharge events in the Coeur d'Alene River. Location of phosphorus amendments should be evaluated prior to such work to ascertain if the application would be in a floodplain area prone to scouring by river flood waters. In addition, the long-term effectiveness of sediment amendments must be assessed to determine if they are a cost-effective means of reducing the bioavailability of lead-contaminated soils to waterfowl.

### *Technical Assessment of Soil Amendment Study*

Per USEPA guidance (USEPA, 2001e), technical assessment of the Soil Amendment Study was conducted by evaluating the following three questions related to protectiveness of the implemented actions:

#### *Question A: Is the remedy functioning as intended by the decision documents?*

The soil amendment study has been conducted in accordance with the 2002 OU3 ROD and study plan but amendments have not yet been implemented at the site as a remedial action.

#### *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?*

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for soil amendments. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

#### *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

This five-year review did not find any new information that calls into question the protectiveness of the soil amendment remedy.

### Remedy Issues

| Table 5-41. Summary of Soil Amendment Study Issues | | |
|---|---|---|
| Issues | Affects Protectiveness (Y/N) | |
| | Current (now to 1 year) | Future (>1 year) |
| **Further Study:** Further study is needed to resolve questions concerning optimal application rates, long-term stability, ecological impacts, and potential seasonal effects. | N | N |

### Recommendations

| Table 5-42. Summary of Soil Amendment Study Recommendations and Follow-Up Actions | | | | | |
|---|---|---|---|---|---|
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Further Studies:** Evaluate findings of follow-up study and, as appropriate, conduct further evaluations of technical feasibility of soil amendments. | IDEQ, USEPA | USEPA | 9/2010 | N | N |

## 5.5.3.4 Silver Dollar Growth Media Pilot

Remedial actions specified in the 2002 OU3 ROD are a combination of access controls, capping, and removals to prevent human exposure and releases to the environment. Many capped sites will require the establishment of vegetation to prevent erosion. The purpose of this pilot is to identify species and techniques to establish viable vegetation on steep slopes.

### Background and Description of Action

*Overview*

The IDEQ initiated a study to identify alternative approaches for reclamation and re-vegetation of waste rock piles in the Coeur d'Alene Mining District. A series of demonstration plots was installed in October 2002 at the Silver Dollar Mine Site, located near Osburn, Idaho. The plots are being used to evaluate various growth media for re-vegetation success and soil stabilization, as well as the cost-effectiveness of each treatment. The project is scheduled to run from 2002 through 2005.

*Site Preparation/Plot Installation*

The waste rock pile was re-graded using a Cat D5 Dozer and ten plots (20 feet by 100 feet) were installed with a berm (3 feet by 2 feet) separating each plot. All earth-moving activities were completed by Nelson Construction. Runoff sampling flumes and a sediment trap were installed at the bottom of each plot. The western- and eastern-most plots were reserved for controls; the remaining plots were assigned to participants on a random basis. Project participants (Table 5-43) were solicited at large and selected by the IDEQ.

**Table 5-43. Silver Dollar Demonstration Project Participants**

| Plot | Treatment | Affiliation | Plot | Treatment | Affiliation |
|---|---|---|---|---|---|
| A | Control (topsoil) | IDEQ | F | Glacier Gold Compost | Glacier Gold, LLC |
| B | Biosolid + Woodash I | Coeur d'Alene Wastewater Treatment Plant | G | Biosol | Rocky Mountain Bio Products |
| C | Potlatch Log Yard Waste | Potlatch Corp., St. Maries, ID | H | Glacier Gold Log Yard Waste | Glacier Gold, LLC |
| D | Kiwi Power | Quattro Environmental, Inc. | I | Biosolid + Woodash II | Coeur d'Alene Wastewater Treatment Plant |
| E | Eko Compost | Eko Compost | J | Control (fertilizer) | IDEQ |

Two soil samples were collected and analyzed prior to regrading the site and a third soil sample was collected from the control plots following regrading but prior to installation of plot amendments. Installation of the plots began September 25, 2002, and concluded October 23, 2002. Each plot was seeded, either by hand or by hydroseeding, using a standardized seed mix (Table 5-44). Following plot installation, the lower access road was closed using an earthen berm and a barbed wire fence was installed around the perimeter of the site.

*Plot Evaluation*

Plant coverage measurements were conducted using two methods. Percent vegetative frequency was determined using a cover-point optical projection scope. This instrument projects an extremely fine point from which the observer can precisely determine a hit or miss of vegetation. This method eliminates much of the bias associated with estimating percent cover using the conventional line-transect method. In this study, 100 points were recorded at 1-meter intervals along a randomly located transect in each plot. Each point identified an individual plant, rock, bare soil, or litter.

The second vegetation measurement determined coverage on an area (plants/square meter) basis. Vegetative coverage was assessed at two sampling points per plot, 10 meters in from the bottom and top of the plot. The specific location of the sampling point was randomly selected—the observer faced away from the plot and tossed a 1-square-meter PVC hoop over their head into the plot. Each individual plant within the hoop was tallied and identified, including plants that were not a component of the original seed mix.

In conjunction with the plant coverage assessment, a composite soil sample consisting of three separate samples was collected from each plot. A standard fertility test, particle size analysis, and total recoverable metals analysis was determined for each sample. All laboratory work was conducted at the University of Idaho Analytical Sciences Laboratory. All plant identifications were made by Jill Blake (Consulting Botanist).

**Table 5-44. Seed Mix Used on the Silver Dollar Demonstration Plots**

| Common Name | Scientific Name | PLS Amount/Acre | Percent by weight | Min. percent |
|---|---|---|---|---|
| Slender wheatgrass | *Elymus trachycaulus ssp. Trachycaulus var. Revenue* | 14 lbs | 22.3 | 21.9 |
| Idaho fescue | *Festuca idahoensis var. Joseph* | 8 lbs. 7 oz | 13.4 | 13.2 |
| Sheep fescue | *Festuca ovina var. Covar* | 7 lbs | 11.1 | 10.9 |
| Mountain brome | *Bromus marginatus var. Bromar* | 7 lbs. 11 oz | 12.2 | 12.0 |
| Meadow brome | *Bromus biebersteinii var. Paddock* | 8 lbs. 7 oz | 13.4 | 13.2 |
| White Yarrow | *Achillea millefolium* | 11 oz | 1.1 | 1.1 |
| Blue flax | *Linum lewisii var. Appar* | 4 lbs. 3 oz | 6.7 | 6.6 |
| Rocky Mountain penstemon | *Penstemon strictus* | 1 lb. 6 oz | 2.2 | 2.2 |
| White dutch clover | *Trifolium repens L.* | 8 oz | 0.8 | 0.8 |
| Canada bluegrass | *Poa compressa* | 11 oz | 1.1 | 1.1 |
| Big bluegrass | *Poa ampla var. Sherman* | 1 lb. 7 oz | 2.3 | 2.3 |
| Canby bluegrass | *Poa canbyi var. Canbar* | 1 lb. 6 oz | 2.2 | 2.2 |
| Cicer milkvetch | *Astragalus cicer* | 7 lbs. | 11.1 | 10.9 |
| Fireweed | *Epilobium angustifolia* | 1 oz | 0.1 | 0.1 |
| Weed seed | | | | 0.5 (Max) |
| Inert and other crop | | | | 1.5 (Max) |

*Vegetation Assessment*

Figures 5-10 and 5-11 provide a comparison of plant frequency and plant density across all plots. Each plot has two data bars corresponding to frequency or density results for 2003 and 2004.

**Plant Frequency.** Plant frequency describes the probability of finding any plant, or a particular species, at a given point along a transect line. Frequency is expressed as a value between 0 percent and 100 percent, representing the percentage of sampling points where a plant was observed during sampling. Each plot exhibited greater plant frequency in 2004, compared with 2003 (Figure 5-10). Plots exhibiting the greatest increase in plant frequency included the Topsoil Control (Plot A), Kiwi Power (Plot D), Glacier Gold Compost (Plot F), and Glacier Gold Log Yard Waste (Plot H). Note that plant frequency on the Potlatch Log Yard Waste plot was non-existent in 2003 but following reseeding, was among the highest in 2004.

Some plots (i.e., Biosolids, Eko Compost, and Biosol) favored the establishment and growth of grasses over dicots in 2003, and this pattern continued in 2004 (Figure 5-10). A visual inspection of the Biosolid and Eko Compost plots confirms the presence of large, very robust plants; a growth habit that is characteristic of high levels of available nitrogen.

Although the Biosol plot exhibits a preponderance of grasses over dicots, the plants are less vigorous and the overall frequency is lower, most likely due to lower nitrogen availability. While the remaining plots exhibited roughly the same ratio of monocots to dicots in 2003 and 2004, an exception was observed in the Topsoil Control (Plot A), where a significant increase in unseeded vegetation occurred. The proportion of dicots also increased in Kiwi Power (Plot D) and Glacier Gold Compost (Plot F), both of which experienced a significant increase the frequency of yarrow.

**Plant Density.** A somewhat different vegetative profile is evident when the plots are assessed on a plant density basis (Figure 5-11). Density describes the number of individual plants observed within a specified area. A one square meter sampling area is frequently used for rangeland and vegetation restoration studies involving non-woody species. While vegetation frequency increased in all plots, the response of plant density was variable, increasing in some plots and decreasing in others. Plot A (Topsoil-Control) exhibited the greatest increase in density, which, as discussed above, is due to a significant increase in unseeded vegetation. Plot F (Glacier Gold Compost) and Plot G (Biosol) also exhibited increased density. However, these changes were associated with increased dicot vegetation in the first case (Glacier Gold) and grasses (Biosol).

Both Biosolid plots (Plots B and I) experienced decreases in vegetative density. However, it is important to note that neither of these plots is exhibiting diminished performance. These plots, along with Eko Compost (Plot E) exhibit very robust and mature vegetation relative to the same species growing on the other plots. It is likely that the sheer size of the vegetation is a limiting factor for density in the Biosolid and Eko Compost plots.

A contrasting density result is observed in the Topsoil Control, Kiwi Power, and Biosol plots. These plots appear to be sparsely vegetated at first glance. A closer examination indicates each of these amendments is supporting large numbers of small plants and, in terms of sheer numbers of plants per unit area; these plots exhibit relatively high plant densities (Figure 5-11).

As was evident in the Year 1 results, a generalized trend is for a given plot to exhibit one of two vegetation profiles:

- High plant <u>frequency</u> with large robust vegetation (primarily grasses); e.g., Biosolid/Wood Ash I, Eko Compost, Biosolid/Wood Ash II;
- High plant density with smaller plants (mixture of grasses and dicots); e.g., Kiwi Power, Glacier Gold Compost and Log Yard Waste, Biosol; and
- One additional trend that is apparent when comparing Year 1 to Year 2 data is that the species distribution within some plots is changing. This is most obvious in the frequency data, particularly on those plots dominated by grasses (i.e., Biosolids and Eko Compost). In addition, the plots that tend to exhibit more vegetative diversity (i.e., are not dominated by grasses) showed significant increases in yarrow (i.e., Kiwi

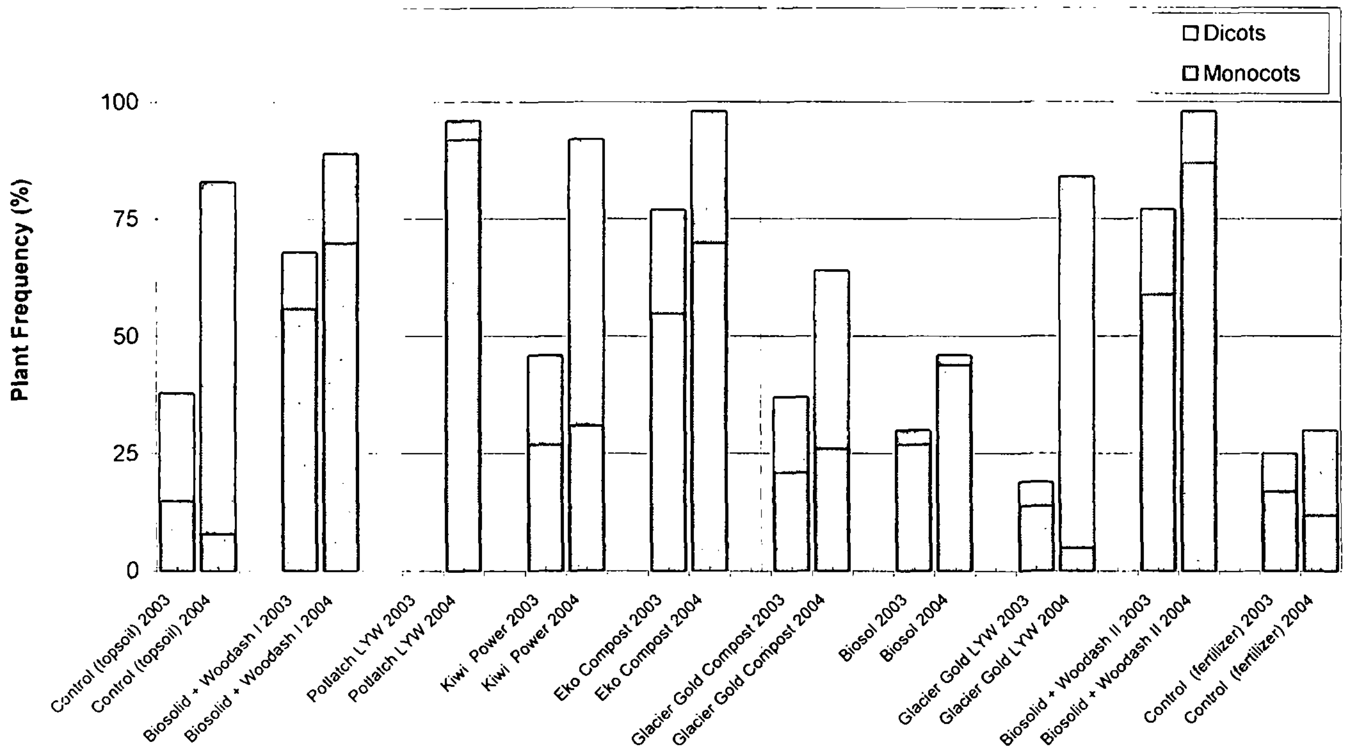



**Figure 5-10. Comparison of Plant Frequencies across All Plots**

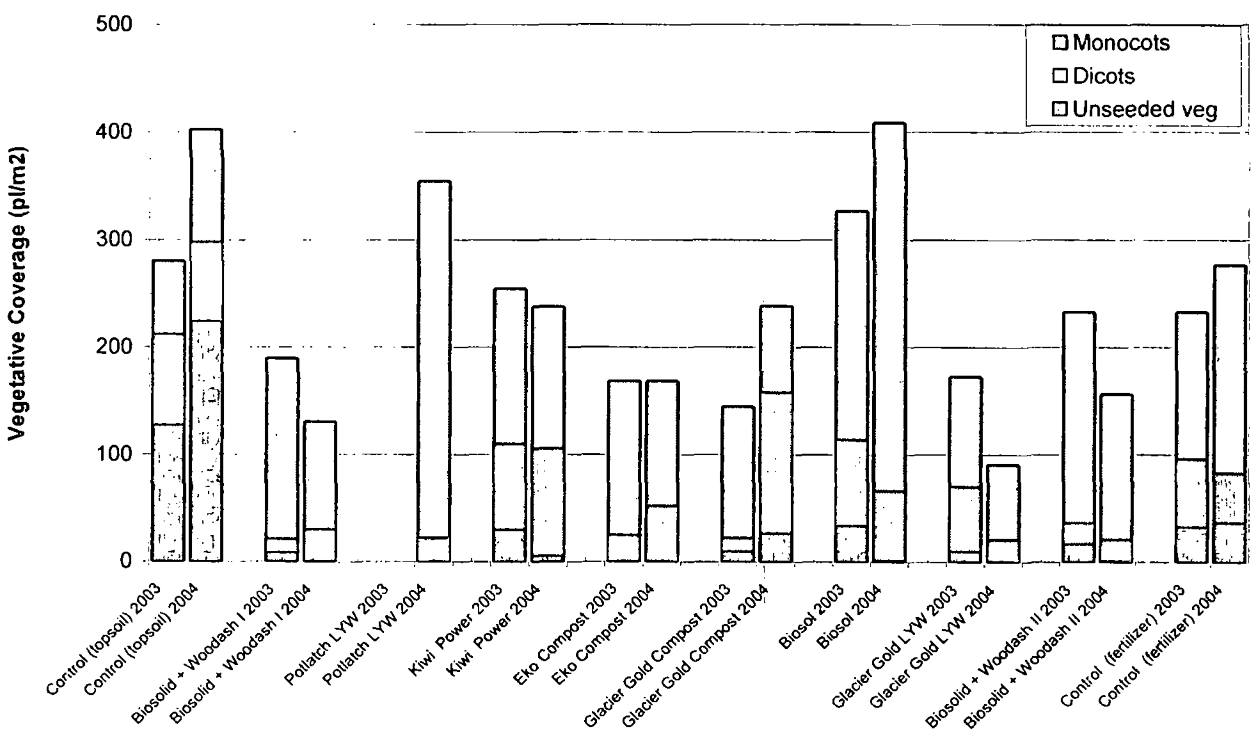



**Figure 5-11. Comparison of Plant Densities across All Plots**

Power and Glacier Gold Compost). Also, the frequency of white clover increased in 2004, most notably on Plot H (Glacier Gold Log Yard Waste). Both yarrow and white clover produce many profuse seed heads, which suggests the incidence of these species is likely to increase in the future.

**Unseeded Vegetation.** As was the case with the seeded vegetation, there were significant changes in both the density and species distribution of unseeded vegetation. Unseeded vegetation comprises a significant portion of total plant density on Plot A (Figure 5-11). Approximately 42 percent of the plants on the control-topsoil plot (Plot A) in 2003 were unseeded species, and this percentage increased to 55 percent in 2004. In contrast, the remaining plots exhibited weed densities below 10 percent.

*Surface Runoff*

Nitrogen and phosphorus concentrations in surface runoff varied significantly among the demonstration plots. Both controls exhibited low concentrations of ammonium-N, nitrate-N, and ortho-phosphate as did the Biosol and Glacier Gold Log Yard Waste Plots. Intermediate ammonium- and nitrate-N concentrations were observed in the Kiwi Power, Eko Compost, and Glacier Gold Compost plots. It was somewhat surprising to observe significant differences in runoff nitrogen between the Biosolid/Wood Ash I and Biosolid/Wood Ash II plots.

A generalized trend expected for plots receiving organic amendments would be higher ammonium values in the spring in response to increased soil temperatures and organic nitrogen mineralization. Nitrate-N values should lag behind ammonium-N and increase during the summer as nitrification occurs. This pattern was most clearly observed on the Eko Compost and Biosolid/Wood Ash II plots.

The highest N concentrations were observed in runoff from the Potlatch Log Yard Waste plot. This is undoubtedly due to the blending of very high levels of urea fertilizer with the log yard waste. This plot also exhibited the stepwise increase in nitrate-N expected as urea is oxidized to nitrate via the nitrification process.

Ortho-phosphate concentrations were generally low in the runoff samples. The highest P values were observed in the Eko Compost and Glacier Gold Compost plots. In both cases, the ortho-phosphate concentrations rarely exceeded 2 mg/L.

*Soil Properties*

The native soil is an alkaline (pH 8.3) sandy loam with a high percentage of coarse (> 2 mm) fragments. Native fertility is low as is illustrated by the low concentrations of extractable ammonium-N, nitrate-N, P and K, and low organic matter. The addition of 50 lb of 16-16-16 fertilizer increased the extractable N, P, K profile of the native soil.

Each of the various amendments created a seedbed with substantially higher fertility than the native soil. The highest extractable P values were observed on the Eko Compost and Glacier Gold Compost plots while the two Biosolid/Wood Ash plots as well as the Eko Compost plot exhibited the highest extractable K concentrations. The highest nitrate-N values were observed on the Biosolid/Wood Ash and Potlatch Log Yard Waste plots. In each plot receiving an amendment relatively high in N (e.g., Biosolids, Potlatch, Eko Compost), the nitrate-N exceeded the ammonium-N values reflecting significant nitrification had occurred. High soil nitrate values can be beneficial if the N is consumed via plant uptake. However, nitrate is quite mobile in soils which can lead to potentially high N in surface runoff.

Organic matter contents were much higher in the demonstration plots, relative to the control, with the exception of the Kiwi Power and Biosol plots. High organic matter imparts many desirable physical soil properties including low bulk density, high porosity, and high water holding capacity. Electrical conductivity (salinity) was elevated by addition of the Biosolid/Wood Ash and Potlatch Log Yard Waste. However, these values do not indicate that soil salinity will create problems for re-vegetation on any of the treatments. It was somewhat surprising to learn that the particle size distribution and textural class designation was not affected by the various organic amendments. However, the percentage of coarse fragments was generally lower in the plots receiving organic amendments.

The total recoverable metals profile of the amended soils did not differ appreciably from the native soil. The primary differences observed were elevated levels of Ca, K, and Na in the Biosolid/Wood Ash plots, no doubt due to the presence of alkaline earth oxides in wood ash.

### *Technical Assessment of Silver Dollar Growth Media Pilot*

Per USEPA guidance (USEPA, 2001e), technical assessment of the Silver Dollar Growth Media Pilot was conducted by evaluating the following three questions related to protectiveness of the implemented actions:

#### *Question A: Is the remedy functioning as intended by the decision documents?*

As a research project, performance has exceeded expectations. Monitoring has been conducted in 2003 and 2004 and needs to be continued in 2005.

#### *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?*

Yes.

#### *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

This five-year review did not find any new information. Monitoring has been conducted in 2003 thru 2005. Annual monitoring needs to be continued beyond 2005.

### *Remedy Issues*

**Table 5-45 Summary of Silver Dollar Growth Media Pilot Issues**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| None. | --- | --- |

### *Recommendations*

**Table 5-46 Summary of Growth Media Pilot Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Further Monitoring:** Continue annual monitoring and use results to help develop vegetative covers for future remedial actions. | IDEQ | IDEQ | Ongoing | N | N |

## 5.5.4 Washington Recreation Areas along the Spokane River

### 5.5.4.1 Review of Rod, ESD, & ROD Amendment Requirements

The Selected Remedy for the Washington recreation areas along the Spokane River identified in the 2002 OU3 ROD is a combination of access controls, capping, and removals of metals-contaminated soil and sediment. The remedy includes water-quality monitoring, aquatic-life monitoring, remedial-performance monitoring of sediments, and contingencies for additional or follow-up cleanups for the recreational areas. Ten shoreline recreation areas and one subaqueous area along the Spokane River in Washington State have been identified for further investigation and remedial action.

Other than the cleanup actions for impacted shorelines and sediments, measurable improvements to water quality in the river will ultimately rely primarily on actions performed upstream. The degree and duration of potential recontamination and the measurement of improvements to ambient surface water quality will be closely tied to the pace and scope of the cleanup actions in the Lower Coeur d'Alene Basin and Upper Coeur d'Alene Basin, as well as to the long-term retention of metal in Coeur d'Alene Lake sediments.

The sediment lead cleanup level for the Washington recreation areas along the Spokane River is 700 mg/kg for recreational use (USEPA, 2002a), and the sediment arsenic cleanup level as selected by the USEPA is 20 mg/kg for recreational use. Implementation of the remedy, as defined by the 2002 OU3 ROD, will reduce the potential for exposure to metals at the beaches and shoreline recreational areas and will enhance human uses of ecological resources. These reductions will be closely tied to the pace and scope of the cleanup actions in the Lower Basin and Upper Basin, as well as the long-term retention of metals in Coeur d'Alene Lake sediments.

The 2002 OU3 ROD also states that additional cleanup of critical habitat areas identified by the Washington State Department of Ecology will reduce risks to waterfowl and other ecological receptors to generally safe levels. The critical habitat areas along the Washington State Spokane River have been identified by the Washington State Department of Ecology to include: Starr Road, Island Complex, Murray Road, Harvard Road, and the North Bank. Implementation of the remedy for the Spokane River is not anticipated to result in significant reductions of metals concentrations in surface water, which will be closely tied to the pace and scope of the cleanup actions in the Lower Basin and Upper Basin, as well as the long-term retention of metals in Coeur d'Alene Lake sediments.

#### 5.5.4.2 Background and Site Description

Spokane River sediments were sampled in 1998 and 1999 (Groisbois, 1999), summer/fall 1999 (USEPA, 2000c), and August/September 2000 (USEPA, 2001i). Lead concentrations from sediment sampled in 1999 upstream of Upriver Dam ranged from 107 mg/kg to 1,410 mg/kg, with one of six locations having an average concentration above the lead screening level of 700 mg/kg. Lead concentrations from the 2000 sampling event ranged from 70 mg/kg to 1,140 mg/kg. Two of the 25 areas sampled had average lead concentrations greater than 700 mg/kg. Two areas found between Harvard Road Bridge and the Idaho state line had lead concentrations of 760 mg/kg and 140 mg/kg, respectively. A health advisory regarding ingestion of beach and shoreline sediment and a fish consumption health advisory for the Spokane River from the state line to Ninemile Dam currently exists. These advisories include signs that have been posted along this portion of the river to alert the public to elevated levels of lead in the beach soils and describe ways the public can minimize the risk of lead exposure.

The Starr Road and Island Complex Recreation areas have been prioritized for remedial design due to higher levels of lead contamination and high human use when compared to the other areas along the Spokane River. Advisory signs are in place today at these two locations. When remedial action is complete at these two areas, further assessment will begin on the remaining recreational areas along the Spokane River.

The Starr Road area is popular with local residents and includes areas associated with rainbow trout spawning habitat. Soil data previously collected from the upland area in 1999 included seven samples from the 0-1 foot below ground surface (bgs) interval and analyzed for total metals. Lead results ranged from 660 mg/kg to 2,400 mg/kg, six of which were above the human health soil action level of 700 mg/kg. Arsenic results ranged from 21 mg/kg to 35 mg/kg. Zinc results ranged from 2,000 mg/kg to 3, 300 mg/kg, all below human health action levels of 24,000 mg/kg, cadmium results ranged from 10 mg/kg to 21 mg/kg, all below the human health action level of 80 mg/kg.

The Island Complex area is located a short distance upstream east and south of the Starr Road area. This area is directly adjacent to park land open space recently acquired by Spokane County. Protection of human health is the remediation objective for this area. In 2000, soil samples were collected from the east side of the Island Complex area. Samples were tested for metals using a portable x-ray fluorescence (XRF) analyzer. Samples were taken from seven locations (from 0 to 1 foot below ground surface [bgs]) and analyzed for lead, arsenic, and zinc. Lead results ranged from 298 to 533 mg/kg. Seven surface (0 to 6 inches bgs) readings were also taken with lead results ranging from 440 mg/kg to 1,030 mg/kg. Six readings were taken at depths ranging from 0 to 2.3 feet bgs, with lead results ranging from non-detect to 2,280 mg/kg. One of these samples' results was above the human health action level at 0.16 feet bgs. All lead detections were located in the top 6 inches. Arsenic concentrations from soil samples collected at the Island Complex area in 2000 ranged from 62 mg/kg to 76 mg/kg. Of the seven surface (0 to 6 inches bgs) readings, arsenic results ranged from 72 to 94 mg/kg. Arsenic concentrations were higher nearer to the surface ranging from 43 to 130 mg/kg. Arsenic concentrations from soil samples collected in 2004 ranged from 11 mg/kg to 29 mg/kg in the lower bar. Zinc concentrations from the soil samples collected at the Island Complex area in 2000 ranged from 1,050 mg/kg to 1,890 mg/kg. Zinc results ranged from 1,660 to 4,580 mg/kg, respectively, from the surface soil 0 to 6 inches bgs. Like arsenic, zinc results were higher nearer to the surface, ranging from 258 mg/kg to 4,210 mg/kg.

#### 5.5.4.3 Actions Since the 2002 OU3 ROD

Since the 2002 OU3 ROD, the USACE conducted additional sampling in August 2004 at the Starr Road and Island Complex recreational areas. The goal of the sampling was to gather further information in order to define cleanup boundaries for the recreational areas. Chemicals analyzed included lead, arsenic, cadmium, and zinc. Both lead and arsenic concentrations from this sampling event were considerably lower than historical concentrations found in 2000; however, lead exceedances, in particular, exist that will require remedial action.

The design of the Starr Road recreation area was completed in 2005, and the remedial action will be implemented in 2006. As part of this design, leachability was assessed using the synthetic precipitation leaching procedure (SPLP) to determine if excavated material could be reused in the construction of a parking lot. In addition, moisture content of the material and frost susceptibility of the material was analyzed. No SPLP metal exceedances were found. In order to determine whether excavated material would be eligible for disposal at either a Subtitle C landfill or Subtitle D landfill, hazardous waste characterization of material was done using the toxicity characteristic leaching procedure. No TCLP exceedances were found.

The design for Island Complex will be completed in 2006, and the remedial action initiated in 2006.

#### 5.5.4.4 Technical Assessment of the Starr Road and Island Complex Remedial Design and Proposed Remedial Actions

Per USEPA guidance (USEPA, 2001e), technical assessment of the Washington recreation areas along the Spokane River designs and proposed remedial actions was conducted by evaluating the following three questions related to protectiveness of the actions to be implemented.

***Question A. Is the remedy functioning as intended by the decision documents?***

The remedy has not yet been implemented.

***Question B. Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

These are still valid as written in the 2002 OU3 ROD; however, because an arsenic cleanup level was not specified in the ROD, the USEPA will use 20 mg/kg as the arsenic cleanup level consistent with human health RAOs and Method A of the Washington State Model Toxics and Control Act (MTCA). See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

### *Question C. Has any other information come to light that could call into question the protectiveness of the remedy?*

There has been no new information that calls into question the protectiveness of the Washington recreation areas along the Spokane River remedy.

#### *Remedy Issues*

**Table 5-47. Summary of Remedy Issues, Spokane River, Washington, Recreation Areas**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| None | -- | -- |

#### *Recommendations*

The overall recommendation for the Washington recreational areas along the Spokane River is to proceed with the remedial design and implement a remedy that is protective of human health and the environment. Areas determined to contain metals concentrations greater than the action level for human health risks will be remediated, and replaced with clean material. Habitat considerations will be addressed by choosing the appropriate grain size of the clean material that would enhance the spawning habitat of the rainbow trout. Excavated material will be disposed of in a landfill.

**Table 5-48. Summary Recommendations and Follow-Up Actions, Spokane River, Washington, Recreation Areas**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| None | -- | -- | -- | -- | -- |

## 5.5.5 Mine and Mill Sites

The remedy for environmental protection in the Upper Basin and Lower Basin consists of priority cleanup actions that could be implemented within an approximately 30-year period and would make significant progress toward protection of human health and the environment, ARARs compliance, effectiveness, implementability, and cost-effectiveness. These actions are designed to address dissolved metals (particularly zinc and cadmium) in rivers and streams, lead in floodplain soil and sediment, and particulate lead in the surface water. These actions will provide protection for ecological receptors and improve water quality to be able to meet drinking water standards in the future. In addition to environmental protection, the actions described in the following sections have significant human health benefits, particularly for children and adults who recreate at these sites.

### 5.5.5.1 Upper Basin

In the Upper Basin, this work is primarily focused on mine and mill sites in Canyon Creek, Ninemile Creek, Pine Creek and the SFCDR. The 2002 OU3 ROD identifies a number of mine and mill sites for cleanup in the Upper Basin. Working through the Basin Commission Mine and Mill sites PFT, the following four sites were identified as the initial priority for cleanup: the Sisters Site in Canyon Creek, the Constitution Site in Pine Creek, the Rex Mine and Mill Site in Ninemile Creek, and the Golconda Site on the SFCDR. Other sites in the 2002 OU3 ROD will be prioritized and moved into the remedial design/remedial action phase as funds become available.

#### *Canyon Creek – Sisters*

Actions taken to date to address water quality in Canyon Creek are described in Sections 5.4 and 5.5.3.1. The USEPA has initiated a remedial design at the Sisters Mine in Canyon Creek. The Sisters Mine is a small site located within the Canyon Creek Watershed adjacent to the community of Woodland Park near Wallace, Idaho. Mining development at the site was initiated in 1905 but did not become fully established until approximately 1920 (USEPA, 2002a). During its operational years (i.e., 1920 to 1929) the mine generated approximately 472 tons of ore and 68 tons of tailings material. The OU3 RI (USEPA, 2001c) identified waste rock piles at the site.

Major features of the site include:

- An adit (overgrown with vegetation) located on the northern edge of the site;
- A former access road located along the northeast perimeter of the site;
- Two unvegetated and slightly eroded escarpments with slopes of 1.5 horizontal to 1 vertical and 1horizontal to 1 vertical;
- Remnant mining track rails located on top of the escarpment; and
- A refuse pile located in the southeast portion of the site containing mining-related and non-mining related wastes.

The remedial benchmark for the Sisters Mine is to protect area residents and recreational users (USEPA, 2002a). Therefore, at a minimum, remedial efforts at the Sisters Mine should limit the exposure potential of contacting arsenic- and lead-contaminated soils. Based upon the information collected during the pre-remedial design investigation (Parametrix, 2005), it is anticipated that this is best achieved by a combination of site recontouring, clean soil and native vegetative cover, and elimination of access points. Based upon the current data, with the exception of site water management issues and continued monitoring, no additional action is required to treat the adit discharge and/or underlying groundwater. The design was completed in July 2005 and the remedy constructed by the IDEQ in July/August 2005.

#### *Ninemile Creek – Rex Mine and Mill*

The cleanup locations for the East Fork of Ninemile Creek are shown in Figure 12.2-2 of the 2002 OU3 ROD. The water treatment actions currently underway at the Success Mine are described in Section 5.4.3. The USEPA has initiated a remedial design for the Rex

Mine and Mill Site. The Rex Mine and Mill Site is located in the East Fork of the Ninemile Creek Watershed approximately seven miles north of Wallace, Idaho.

The mill subarea covers approximately 6.5 acres. The tailings pile is composed of fine-grained, ground rock materials that are remnants after the removal of minerals during the heavy media separation and flotation extraction process that was carried on within the mill complex. High concentrations of arsenic (50 mg/kg) and lead (46,600 mg/kg) have been measured in the tailings. The tailings pile completely fills the small drainage with which it is associated, thus impounding the small creek that previously occupied the drainage. Water emerges from the pile contaminated with dissolved and suspended metallic constituents, primarily zinc, cadmium, and lead. The face of the tailings dam is 63 feet high and has a slope of 1.5 horizontal to 1 vertical (38 degrees). This, in combination with the nature of the material, makes it unstable and subject to major failure. Failure of this dam could result in major impacts to Ninemile Creek which has already undergone extensive cleanup work by the SVNRT. Portions of the subarea are managed by the BLM and portions are on private property. In 2004, the BLM conducted a limited removal action to stabilize the flow channels and surface water drainage around the tailing pile along with stabilization efforts on the dam face to reduce erosion. The BLM has also been collecting flow and water level information for the past several years as part of their investigations of the stability and water discharges at the site. Current use of the subarea is recreational, including use by all-terrain vehicles (ATVs), as it is easily accessible by road.

The purpose of the USEPA remedial action is to 1) eliminate human and environmental exposure to contaminants of concern (arsenic, cadmium, lead, and zinc), 2) to reduce the mobility of these contaminants and their subsequent impacts to Rex Creek and the Ninemile Creek drainage, and, 3) to the extent practical, enhance the stability of the tailings impoundment by diverting perennial stream flows around the impoundment and limiting infiltration by establishing positive drainage. Another objective of the project is to reduce surface run-on and infiltration to and through the waste sources located at the subarea by minimizing infiltration from Rex Creek and stormwater. Work required to achieve this objective may includes moving, consolidating, or regrading onsite tailings and waste rock. The work also may include construction of a diversion channel, surface water run-on/run-off control ditches, an adit discharge collection and diversion system, installation of culverts, and construction of a new subarea access road.

The USEPA is evaluating pre-design data and geotechnical information prior to initiation of the remedial design. The initial design efforts have begun with completion of the design scheduled for Spring 2006. Construction is scheduled to start in the summer of 2006 and may take two field seasons to complete.

### *Pine Creek - Mine and Mill Sites*

The Pine Creek cleanup actions and predicted fisheries status after implementation of the remedy in the 2002 OU3 ROD are shown in Figure 12.2-5 of the ROD. Considerable cleanup work has already been conducted in the Pine Creek watershed, particularly by the BLM. This work includes a number of removal actions which are discussed in Section 5.4. These sites include: Highland-Surprise, Nevada-Stewart, Hilarity, Little Pittsburgh, Sidney (Denver Creek), and Nabob. The following site work is being implemented pursuant to the 2002 OU3 ROD.

*Upper and Lower Constitution*

This site is on the East Fork of Pine Creek, upstream of its confluence with Gilbert Creek, approximately 8 miles south of Pinehurst. This subarea consists of the Upper Constitution and Lower Constitution, which is an abandoned lead, silver, and zinc mine and mill site. Upper Constitution includes two large fine-grain tailings piles containing a total of approximately 36,000 cubic yards of mill tailings. The tailings piles are uncontained and are subject to extensive migration via runoff and erosional transport. The East Fork of Pine Creek skirts the tailings piles immediately to the west and is eroding the banks of the lower pile. High concentrations of arsenic (139 mg/kg) and lead (4,930 mg/kg) have been measured in the tailings piles.

The USEPA and the BLM tasked the USACE to prepare a remedial design for this site. Actions for this subarea are designed to prevent direct human contact with metals from recreational exposure and prevent further erosion of the source areas into Pine Creek. The piles are subject to surface erosion that creates gullies and slumping of the eroded areas accelerating the movement of materials to Pine Creek. Tailings from Lower Constitution will be relocated to Upper Constitution, capped with a low-permeability cap, and revegetated. Actions to stabilize the rock dump and stream banks and revegetate the entire subarea would also be included as part of a comprehensive action.

The remedial design was completed in August 2005 with construction scheduled to begin during either late fall 2005 or spring/summer 2006. Implementation of the remedial action will be funded by the USEPA with some contribution by the BLM.

***South Fork - Golconda Mine and Mill***

The Golconda Mine and Mill Site is located along the north banks of the Upper SFCDR below Trowbridge Gulch (USEPA, 2002a). This subarea includes a small tailings impoundment (estimated volume of tailings is 6,000 cubic yards) as well as streambank tailings and contaminated soils (total estimated volume is 17,000 cy). The streambank tailings are within and adjacent to the SFCDR and are subject to ongoing erosion. High concentrations of arsenic (3,010 mg/kg) and lead (65,700 mg/kg) have been measured at the surface and in the tailings in the impoundment. This subarea is easily accessed and frequently used for recreational purposes and has been used in the past for the annual Wallace ATV Jamboree. It is also adjacent to the Trail of the Coeur d'Alenes, a 70-mile trail along the old Union Pacific Railroad right-of-way and within the community of Wallace (see Section 5.8 of this report). The majority of this subarea is on private property.

The remedial design for the Golconda Mine and Mill Site is being conducted by the USEPA. A design for an interim remedial action was completed in August 2005. This action will be implemented by the IDEQ and is intended to address surface water runoff and drainage issues. This work is scheduled to be implemented in the spring of 2006. The overall site design will also be completed by the spring of 2006 with construction scheduled for the summer of 2006.

The principal environmental concerns at this site include:

- Surface soil lead concentrations are in excess of human health criteria in the mine and mill areas, and arsenic concentrations are in excess of human health criteria in the tailings pond and mill area. Based on surface and subsurface data, volumes of contaminated media have been estimated to be 44,000 cy waste rock, 7,000 cy pond tailings, and 23,000 cy jig tailings;
- A substantial volume of lead- and arsenic-impacted soils is located within the 100-year floodplain;
- Adit flows represent a small but measurable contribution to metals loading to the SFCDR;
- Zinc and cadmium concentrations in the groundwater beneath the mill areas exceed 7 times the chronic AWQC, and groundwater is a likely contributor of metals loading into the river;
- The waste rock pile is marginally stable under present conditions; and
- Based on ABA analysis, the waste rock and tailings media generally appear to be geochemically stable (i.e., low probability of acid generation by weathering and oxidation of materials).

Based upon the information collected during the pre-remedial design investigation, addressing erosion and transportation of metal impacted waste material from the mine areas waste rock pile and the mill area tailings would reduce transport and loading of metals-impacted sediments to the river. Consolidating and containing waste materials onsite or offsite would reduce the risk of human contact with metals. In addition, reducing contact between surface water and onsite waste material (i.e., contact with stormwater run off and adit flows) will reduce metals loading to groundwater and to the river.

### *Technical Assessment of Upper Basin Mine and Mill Remedial Actions*

Per USEPA guidance (USEPA, 2001e), technical assessments of the four above Upper Basin mine and mill sites were conducted by evaluating the following three questions related to protectiveness of the actions to be implemented:

#### *Question A: Is the remedy functioning as intended by the decision documents?*

The remedial designs for the four above Upper Basin mine and mill sites the USEPA is currently working on are underway. The remedy for these sites has not yet been implemented.

#### *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?*

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the four above mine and mill sites' remedial actions. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

This five-year review did not find any new information that calls into question the protectiveness of the four above Upper Basin mine and mill site remedies.

***Remedy Issues***

**Table 5-49. Summary of Upper Basin Mine and Mill Site Issues**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| None | -- | -- |

***Recommendations***

The overall recommendation for the above Upper Basin Mine and Mill sites is to proceed with the remedial designs and implement the remedies that are protective of human health and the environment. Areas of the sites that are determined to contain metals concentrations greater than the action level for human health risks will be implemented, and replaced or capped with clean material. Actions at the sites will also be taken to reduce or eliminate contaminant inputs into surface or groundwater to be protective of ecological receptors.

**Table 5-50. Summary of Recommendations and Follow-Up Actions, Upper Basin Mine and Mill Sites**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| Complete RDs at Rex and Golconda sites. Initiate construction of the remedy at Constitution, Rex, and Golconda .Identify additional Mine and Mill sites to begin RD. | BLM, IDEQ, USEPA | BLM, IDEQ, USEPA | RD completion at 2 sites 9/2005. RA start at 2 sites 6/2006 | N | Y |

## 5.5.5.2 Coeur d'Alene Mine and Mill

***Review of Decision Document***

Remedial actions for the Coeur d'Alene Mine and Mill, as specified in a 2001 CD between the USEPA and the Coeur 'Alene Mines Corporation and Callahan Mining Corporation (Coeur Silver Valley),[8] include demolition of all structures, access controls, removal of all contaminated soils to minimize direct human exposure, and elimination of major physical safety hazards.

[8] Partial Consent Decree with Coeur Silver Valley Defendants; United States of America v. ASARCO Incorporated, et al.; Case Nos. 96-0122-N-EJL and 91-0342-N0EJL; April 18, 2001.

## Background and Description of Actions

### Introduction

The site is located on the west side of Osburn, Idaho, in McFerran Gulch. The site consists of the following areas: 1) camp shop area, 2) Chilcott Tunnel (also known as "camp adit"), 3) mine facilities area, 4) Coeur d'Alene Mine portal, 5) waste rock pile, and 6) mill building. With the exception of the waste rock pile, which was stabilized and vegetated previously, actions at the site were done in conjunction with a CD.

### Site Characterization

Visual inspection and photo documentation were done for the entire site. It was determined that the mill building was in too poor a condition to be restored. Samples were taken from soils and material accumulations. An action level for lead of 1,000 mg/kg was used and concentrations exceeding this level were found at the mill building, at the assay lab, and at the load-out area. No barrels or containers were found.

### Removal Actions

Prior to demolition, all salvageable metal materials were removed, decontaminated, and taken offsite. The mill building was pulled apart using an excavator. A few large timbers were decontaminated and saved. The remainder of the demolition materials, primarily wood, was fed into a large trailer-mounted chipper which reduced the volume by 90 percent. Samples showed the resultant grindings were non-hazardous and the grindings were spread over the site as mulch.

Once the mill building was removed, the foundations and ore bins were cleaned. Contaminated soils at the lab assay, loading area, and mill building areas were excavated. Approximately 650 cy, 370cy, and 110 cy of soil were excavated, respectively. Confirmation samples were taken to ensure that action levels were met. Disturbed areas were backfilled and hydroseeded.

Contaminated materials were disposed at the Osburn Tailings Pond mine-waste repository. Materials were placed on the surface of the pond in lifts a maximum of 18 inches high and compacted with a vibrating roller. After placement of materials, the disposal area was covered with a 1.5-foot-thick layer of clay and then a vegetated soil cap was installed above it.

### Access Controls

Fencing already at the site was repaired and improved. Both the Chilcott Tunnel entrance and the Coeur d'Alene Mine portal were caved in and blocked with large boulders. Large boulders were also placed at selected potential access points around the site. Signs were placed at appropriate locations.

## Technical Assessment of Coeur d'Alene Mine and Mill

Per USEPA guidance (USEPA, 2001e), technical assessment of the Coeur d'Alene Mine and Mill was conducted by evaluating the following three questions related to protectiveness of the implemented actions:

#### Question A. Is the remedy functioning as intended by the decision documents?

The remedy is performing as designed and no further actions are anticipated.

***Question B. Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

These are still valid as written in the 2001 CD. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

***Question C. Has any other information come to light that could call into question the protectiveness of the remedy?***

There has been no new information that calls into question the protectiveness of the remedy.

*Remedy Issues*

**Table 5-51. Summary of Coeur d'Alene Mine and Mill Issues**

| Issues | Affects Protectiveness (Y/N) Current (now to 1 year) | Affects Protectiveness (Y/N) Future (>1 year) |
|---|---|---|
| None | -- | – |

*Recommendations*

**Table 5-52. Summary of Recommendations and Follow-Up Actions, Coeur d'Alene Mine and Mill**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) Current (now to 1 year) | Follow-up Actions: Affects Protectiveness (Y/N) Future (>1 year) |
|---|---|---|---|---|---|
| None | --- | --- | --- | --- | --- |

### 5.5.5.3 Silver Summit Mill

*Review of Decision Document*

Remedial activities prescribed in a 2001 CD between the USEPA and the Sunshine Mining Company access controls and removal of all reagents to prevent direct human exposure. [9]

*Background and Description of Actions*

The Silver Summit Mill is located on the southwest side of Osburn, Idaho. It operated from 1927 to 1986 and produced 32,456 tons of concentrates.

Initial efforts focused on the preparation of a site safety plan and a reconnaissance of the site to identify and document all areas requiring safety actions. This included a general

[9] Partial Consent Decree with Sunshine Mining and Refining Company and Sunshine Precious Metals, Inc.; United States of America v. ASARCO Incorporated, et al.; Case Nos. 96-0122-N-EJL and 91-0342-N-EJL; December 28, 2000.

description of the locations of material containers and accumulations needing to be addressed. These activities were followed by construction to secure the site and buildings to prevent public access and address safety problems.

The main work involved the labeling of each container with a unique number based on its location and order in the log. All were photographed. Subsequently, all containers were moved to a central location and inspected and, if necessary, sampled to identify the contents. Materials were mainly solvents, lubricants, processing chemicals, paint, and trash. Once identified, the containers were grouped into three categories: material to be stored for future Sunshine use, material to be given to another facility or to the manufacturer, and material to be transported for disposal. A PCB investigation was conducted for all transformers and oil switches located throughout the site and none was found.

Since many of the containers were in poor condition, they were put in new drums or overpacks. They were then loaded on trucks for transport to offsite locations. Those slated for disposal were taken to Safety-Kleen facilities in Utah.

### *Technical Assessment of Silver Summit Mill*

Per USEPA guidance (USEPA, 2001e), technical assessment of the Silver Summit Mill was conducted by evaluating the following three questions related to protectiveness of the implemented action:

***Question A. Is the remedy functioning as intended by the decision documents?***

The remedy is performing as designed and no further actions are anticipated.

***Question B. Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

These are still valid as written in the 2001 CD. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

***Question C. Has any other information come to light that could call into question the protectiveness of the remedy?***

There has been no new information that calls into question the protectiveness of the remedy.

### *Remedy Issues*

**Table 5-53. Summary of Silver Summit Mill Issues**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| None | -- | -- |

### *Recommendations*

**Table 5-54. Summary of Recommendations and Follow-Up Actions, Silver Summit Mill**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| None | — | — | — | — | — |

## 5.5.6 Repositories

### 5.5.6.1 Introduction and Background

Repositories are a critical component of the implementation of the 2002 OU3 ROD and a necessary component toward achievement of the RAOs of reducing human exposure to and mechanical transportation into residential areas of contaminated soils, sediments and source materials. Since well before the completion of the ROD, the IDEQ and the USEPA have jointly worked to provide repositories to facilitate the cleanup in the Basin. Thus far, the cleanup effort has used the Big Creek Repository (see site description below) as the only repository accepted by both agencies to receive waste materials generated from the cleanup effort. Repository location siting processes and criteria are described in the 2002 OU3 ROD (USEPA, 2002a).

#### *Big Creek Repository – Site Description*

The Big Creek Repository (BCR) is located approximately 4 miles east of Kellogg, Idaho, near the confluence of Big Creek and the Coeur d'Alene River. The elevation of the valley floor is approximately 2,400 feet above mean sea level in the site vicinity. Access to the site is from Big Creek Road, an all-weather asphalt road that extends from Interstate 90 (I-90), Exit 54, to the current Sunshine Mine and runs parallel to the east side of the BCR.

The BCR is bounded by the UPRR ROW directly north of the BCR, Big Creek on the west and south sides, and Big Creek Road on the east. The rail line has been removed as part of the UPRR Removal Action as described in Section 5.8. The Big Creek road is owned and operated by Shoshone County. The Shoshone Country Club owns land on the west side of Big Creek, as does a local business person. Formation Chemicals Inc. owns land directly south of the BCR on which a large inactive tailing pond exists. A decant line for the larger tailing pond runs along the west toe of the BCR embankment.

The former pond on which BCR is situated was used for the disposal of tailings produced from the milling of silver, lead, and zinc ore from 1968 to 1979. It has a rectangular footprint of approximately 22 acres and the vertical relief rises from 20 to 40 feet above the valley floor on the south and north ends of the pond, respectively. A more detailed description of the Sunshine tailing pond and surrounding environs is provided in the Big Creek Repository Design Analysis Report (DAR) (USACE, 2004a) and Phase II Field Investigation Report (USACE, 2004e).

#### 5.5.6.2 Review of ROD Requirements

Section 12.5 of the 2002 OU3 ROD contains siting and design criteria and information for construction of repositories. One statement of note says "Repositories constructed pursuant to this ROD will be designed to reliably contain waste material and prevent the release of contaminants to surface water, groundwater, or air in concentrations that would exceed state and/or federal standards."

The pursuit of additional repository sites to support the OU3 cleanup continues in accordance with the four-step process for evaluation of potential sites, development of repository design specifications, and repository operational parameters noted below:

1. Site Identification
2. Technical Evaluation
3. Public Input/Notification
4. Decision Documentation

Further detailed descriptions of each of the above processes are captured in Section 12.5 of the 2002 OU3 ROD. In addition to the parameters in the ROD, the ARARs and TBCs identified therein are used for identification of potential sites, operations, and closure of repositories in the Coeur d'Alene Basin site.

#### 5.5.6.3 Remedial Actions – Big Creek Repository

Activities essentially began in 2002 with the placement of materials at the former Sunshine tailings pond. Prior to 2004, the USEPA and the IDEQ collaboratively managed the operations of the facility and utilized non-time-critical removal funds to investigate and operate the site. Activities in 2004 were essentially the same as those that occurred in the previous years, which included monitoring and a more intensive material placement regiment to facilitate remediation of over 300 yards and ROWs in the Basin yards cleanup program, described in more depth in Sections 5.4 and 5.5.

Extensive investigation and analyses have been conducted to determine that the BCR is suitable for long-term disposal of mine-waste contaminated soils from human health and ecological remediation in the Coeur d'Alene River Basin. The geotechnical stability of the site was investigated by the USACE in 2002 and 2003 using subsurface investigative techniques and subsequent geotechnical stability analyses (USACE, 2002 and 2004e). Additionally, a hydrologic analysis was conducted on Big Creek using Hydrologic Engineering Center-River Analysis System (HEC-RAS) version 3.1 as discussed in the DAR (USACE, 2004a). A critical stream segment was identified in the HEC-RAS analysis as having the potential for super-critical flows during 100-year recurrence interval storm events. The toe of the BCR embankment in the critical stretch was armored in 2004 to protect it as described below (USACE, 2005).

The IDEQ hired a contractor to manage both the yard remediation and material placement at the BCR. Washington Group International, Inc. (WGI) was retained by the IDEQ to facilitate management of the remedial action programs in the Basin and to operate and place waste in accordance with the DAR collaboratively produced by the USEPA and the IDEQ through the USACE in 2004.

Approximately 86,000 cy (56,000 cy compacted) of soils and other materials were disposed at the BCR in 2004 with an additional 20,000 cy disposed in 2002 and 2003. Residual capacity in the repository following the 2004 material placement is estimated at approximately 100,000 to 140,000 cy. It is anticipated that at the current rate of fill, BCR will be at full capacity after the 2007 construction season driving the need for other viable repository sites in the coming year. Annual operations reports are generated each year (USACE, 2003 and 2004d; WGI, 2005). These reports document the source of materials and the estimated quantities, as well as the operational parameters during a given year.

In addition to contaminated soils, over-size concrete debris from previous years was placed in lifts and in-filled with soils. The concrete placement technique was reviewed and approved by the WGI engineers and exact placement was observed by the WGI and the IDEQ professionals.

Wood waste onsite was a remnant problem from the time when Shoshone County used the site to place tree cuttings and other non-contaminated waste materials. In addition, there was a significant amount of treated wood left from the cleanup of the Sunshine mine. These woody materials were inherited with the facility and required disposal. A large chipping machine was mobilized onto the BCR and reduced the piles of over-size woody debris to manageable chips that are suitable for disposal in thin layers within the disposal cell.

Monitoring of groundwater, piezometer, settlement monuments, and surface water was conducted by the WGI and their subcontractor, TerraGraphics during 2004. The site monitoring is consistent with the BCR Operations Plan (USACE, 2004b) and previous monitoring activities conducted by the USACE in 2002 and 2003. Results of the 2004 site monitoring program indicate no significant changes in site conditions, details of which are included in the year-end operations report (WGI, 2005).

The overhead lines on the BCR were surveyed in an arrangement with Avista, the local power company. The WGI facilitated the survey of the lines in the warmest part of the year so that maximum line "sag" could be interpreted for safety reasons. The results indicate that the lines will have to be to be modified to allow for the site to be completed in accordance with the DAR (USACE, 2004a).

Eight interior piezometers have been abandoned, as they were determined to provide no further substantive information, following conversations between the WGI and the USACE site hydrologists.

#### 5.5.6.4 Repository Site Identification Activities

The quest to locate repositories in the Coeur d'Alene Basin in support of the implementation of OU3 began roughly a decade ago. While several search efforts were conducted, the Tribe performed a baseline analysis using Geographical Information Systems (GIS) in 1998. Their report (Coeur d'Alene Tribe, 1998) provided a view of the potential sites regardless of ownership on which further evaluations could be conducted. In addition to operating the existing BCR soil repository, the IDEQ and the USEPA have collaboratively been identifying other potential repository sites. To date, more than 250 potential locations have been identified. The potential sites are owned by various entities including local or state government, private owners, or federal government.

Currently, a site located in east Mission Flats near the Cataldo Mission has been evaluated as a potential future repository site and is undergoing further evaluation and analysis to determine if it is adequate to support the OU3 cleanups. There are new potential sites in the Upper Basin, on which, preliminary evaluations are in the early stages of being conducted.

While it is not known, at this point in time, exactly how many repositories will be required to fully support the cleanups and ICP wastes generated in OU3, it is clear that there is a large demand for additional repository capacity beyond what can be provided at BCR. The 2002 OU3 ROD estimates that up to 3.5 million cy of material may require excavation and disposal. A recent memo prepared by the IDEQ (IDEQ, 2005) put an upper bound on this volume at nearly 6 million cy when ICP wastes are included and a large allowance is made for unknown needs.

The evaluation of potential future repository sites is scheduled to continue for the foreseeable future until adequate repository capacity is attained.

#### 5.5.6.5 Technical Assessment of Remedial Action - Big Creek Repository

Per USEPA guidance (USEPA, 2001e), technical assessment of the Big Creek Repository remedial action was conducted by evaluating the following three questions related to protectiveness of the implemented action:

***Question A: Is the remedy functioning as intended by the decision documents?***

Operation of the BCR was initiated in 2002. Quarterly groundwater and surface water quality monitoring and pore water monitoring has been conducted each year and indicates no significant changes in the site conditions. Operational parameters and engineering controls are protective of human health through dust control, erosion controls, material handling precautions, and decontamination procedures. The final placement of materials and the installation of the final cover are scheduled to be completed by the next five-year review and can be evaluated more fully at that time.

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the BCR operations remedial action.

Section 5.2 summarizes the ARARs review for the applicable OU3 decision documents. In addition, Appendix A of the DAR has a project-specific ARARs analysis for the BCR and has identified the Idaho Water Quality Standards (IDAPA 58.01.02) as potentially applicable. No other ARARs or potential ARARs have been identified for the BCR remedial action.

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

This five-year review did not find any new information that calls into question the protectiveness of the BCR remedy.

### *Remedy Issues*

**Table 5-55. Summary of Repository Issues**

| Issues | Affects Protectiveness (Y/N) Current (now to 1 year) | Affects Protectiveness (Y/N) Future (>1 year) |
|---|---|---|
| **Big Creek Repository:** none | -- | -- |
| **New Sites:** Need for additional repository space. | N | Y |

### *Recommendations*

**Table 5-56. Summary of Recommendations and Follow-Up Actions, Repository**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) Current (now to 1 year) | Follow-up Actions: Affects Protectiveness (Y/N) Future (>1 year) |
|---|---|---|---|---|---|
| **Big Creek Repository:** Continue to implement the remedial action at the Big Creek Repository. | IDEQ, USEPA | IDEQ, USEPA | 09/2010 | N | Y |
| **New Sites:** Continue search and evaluation of potential repository sites. | IDEQ, USEPA | IDEQ, USEPA | 09/2007 | N | Y |

## 5.6 Environmental Monitoring

Section 12.6 of the 2002 OU3 ROD identifies two components for environmental monitoring within OU3. The first is a long-term basin-wide environmental monitoring program that will provide an overarching status and trends assessment of surface water, soil/sediment, and biological resource conditions in the Basin. The second component is remedial-action-specific effectiveness monitoring that will be implemented in conjunction with remedial actions. Both aspects of OU3 environmental monitoring are discussed in detail below.

In their pre-publication report, the NRC noted that "the Basin Environmental Monitoring Plan the agency has developed is much more extensive and comprehensive than normal for a Superfund Site. This plan appears to recognize the complexities and uncertainties of the system and should provide much of the information needed to make informed decisions about the most important and effective cleanup approaches (NRC, 2005, p. 320).

The remedy also includes a lead health intervention program that will provide for monitoring of human health in the community and residential areas. In addition, the remedy also includes monitoring of aquatic food sources, such as fish and water potatoes, for protection of human health. Please refer to Section 5.3 of this document for more information about human health-related monitoring.

## 5.6.1 Basin Environmental Monitoring Plan

### 5.6.1.1 Review of ROD Requirements

Establishment of a Basin-wide environmental monitoring plan is required under the 2002 OU3 ROD (Section 12-6). The monitoring program is critical to the successful implementation and evaluation of the remedy. A key component of the remedy is use of an adaptive management approach to cleanup of the Basin. Monitoring the ecological system in the Basin will provide data to help evaluate cleanup efforts and make adjustments where needed to optimize remedy implementation.

### 5.6.1.2 Collaborative Development

Beginning in January 2002, the USEPA started working with Basin stakeholders to collaboratively develop a long-term Basin environmental monitoring program. Organizations initially involved with the USEPA in development of the monitoring program include the IDEQ, the Washington State Department of Ecology, the Coeur d'Alene Tribe, the Spokane Tribe, the USFWS, the USGS, and the BLM. Environmental-medium-specific workgroups were also established to focus on the specific monitoring needs for surface water, soil/sediment, biota, and Coeur d'Alene Lake. The larger group and the smaller working groups had numerous discussions, teleconferences, and meetings to discuss the formulation of the environmental monitoring program.

Since establishment of the Basin Commission in August 2002, the USEPA, together with the above stakeholders, worked with parties in the Basin Commission and its support teams to continue development of the monitoring plan. The Monitoring PFT was established to focus on monitoring issues. Members were self-selected but included nearly all of the parties involved in the initial monitoring workgroup established in January 2002, as well as additional participants from the TLG. Members of the CCC were invited to attend meetings to stay informed and provide input. Several CCC members indicated particular interest in the monitoring issues and in turn received all subsequent informational e-mails and conference call/meeting announcements.

Ultimately, key stakeholder agencies, including the USEPA, the IDEQ, the Coeur d'Alene Tribe, the Spokane Tribe, the USFWS, and the USGS, concurred that the monitoring plan developed is appropriate given the boundaries established by available funding to obtain technical data for assessment of long-term status and trends, evaluation of overall effectiveness of the remedy, evaluation of progress toward cleanup benchmarks, and future five-year reviews. In addition, the Basin Commission unanimously passed a motion supporting and endorsing implementation of the Basin Environmental Monitoring Plan (BEMP) in February 2004. The BEMP for OU3 was issued in March 2004 (USEPA, 2004).

### 5.6.1.3 BEMP Goals and Objectives

The BEMP implements the environmental monitoring program established as part of the ecological component of the OU3 remedy. The media of focus in the BEMP are surface water, soil/sediment, and biological resources. The major goal of the BEMP is to monitor and evaluate the progress of the remedy in terms of improving ecosystem conditions.

Consistent with that goal, the BEMP will provide data for the following Basin-wide monitoring objectives:

- Assess long-term status and trends of surface water, soil, sediment, and biological resource conditions in the Basin;
- Evaluate the effectiveness of the remedy;
- Evaluate progress toward cleanup benchmarks;
- Provide data for CERCLA-required five-year reviews of the progress on remedy implementation; and
- Improve understanding of Basin processes and variability to in turn improve the effectiveness and efficiency of subsequent remedial action implementation.

Groundwater monitoring is not included in the BEMP because basin-wide groundwater cleanup is not specifically addressed in the 2002 OU3 ROD. The importance of the interrelationship between groundwater and surface water is recognized and groundwater is anticipated to be an important component of remedial-action-specific effectiveness monitoring.

#### 5.6.1.4 Monitoring Plan Design

The BEMP design is founded on several primary principles that are intended to enhance the practicality, robustness, and cost-effectiveness while maintaining adequate technical rigor and effectiveness. First, the BEMP is based on the remedy selected in the 2002 OU3 ROD. The ROD identifies benchmarks that include key indicators of ecological improvement representing the broad range of ecological conditions in the Basin. These key indicators were selected based on the results of the remedial investigation, feasibility study, ecological risk assessment, supporting technical memoranda, and stakeholder input.

The following key indicators of ecosystem change are the focus of the monitoring program:

- Dissolved and total metals and nutrients in surface water;
- Metals in soil and sediment in riverine and riparian environments in the Upper Basin (Ninemile Creek, Pine Creek, and South Fork); in riverine, riparian, lacustrine, and palustrine environments in the Lower Basin; and selected sediment areas of the Spokane River;
- Fish, macroinvertebrates, and aquatic habit in riverine environments;
- Songbirds, riparian vegetation, and invertebrates in riparian environments;
- Waterfowl in wetland environments; and
- Waterfowl and fish in lake environments.

Second, the monitoring program uses parameters and sampling frequencies that are intended to be sensitive and responsive to the potential rates of relevant environmental changes in the Basin over the period of the remedy implementation. Given the large area of the Basin and the pace of remedy implementation over the 30-year time frame, it is anticipated that relevant and detectable changes in environmental media may occur relatively slowly. Consequently, some parameters will be monitored at relatively long intervals (e.g., 5 or 10 years). The monitoring program includes more frequent (e.g., several times per year, annually, or event-triggered) sampling at key locations (e.g., South Fork near confluence with North Fork, Coeur d'Alene River near Coeur d'Alene Lake, etc.). These "sentinel" locations will provide data on potential short-term trends or "trend discontinuities" in the longer-term trends. The sentinel data also will be used to aid interpretation of data from the more spatially comprehensive, but less frequent, sampling events. This approach will reduce the expense associated with sample collection and analysis while maintaining adequate monitoring effectiveness in terms of sensitivity and responsiveness.

BEMP results will be integrated with data from remedial-action-specific effectiveness monitoring and monitoring conducted under other programs (e.g., Coeur d'Alene LMP, State of Idaho Beneficial Use Reconnaissance Program monitoring, etc.). This approach is expected to reduce monitoring redundancy and enhance cost-effectiveness. Remedial action effectiveness monitoring has been underway in OU1 and OU2 and will be initiated as OU3 remedial actions are implemented. The environmental monitoring in OU2 will be revised to ensure coordination with the Basin-wide monitoring as part of this five-year review. The monitoring conducted under the BEMP will also be coordinated with the other monitoring efforts in the Basin to ensure as much commonality and compatibility as practical, given potentially different authorities, management goals, and jurisdictions.

#### 5.6.1.5 BEMP Monitoring Activities

The environmental monitoring identified in the BEMP includes sampling, testing, and evaluation of three primary media: surface water, soil/sediment, and biological resources. The specific monitoring activities, sample locations, and schedules for the BEMP are summarized in Table 5-57, Figure 5-12, and Table 5-58.

BEMP monitoring activities were initiated in 2004, so the results available to date are limited. The surface water monitoring program, however, was started with the beginning of Water Year (WY) 2004 (October 1, 2003). The sediment monitoring at 16 sites also occurred in fall 2004.

Biological resource monitoring activities conducted during 2004 included a songbird population survey, aquatic invertebrate diversity/abundance at three locations, and a bull trout habitat/temperature assessment. Only the songbird population survey results are available at this time. As identified in the BEMP (USEPA, 2004), the USFWS conducted songbird diversity and abundance surveys in Pine Creek and the Lower Basin in 2004. Methods included those identified in Upper Columbia Fish and Wildlife Office (UCFWO) Standard Operating Procedure (SOP) number 1020.1012, Monitoring Avian Productivity and Survivorship. Banding stations were established in riparian areas of Pine Creek and Springston in the Lower Basin. All data were submitted to the Institute for Bird Populations for validation and comparisons to national data.

As this protocol is intended to provide long-term data on population and demographic parameters of songbirds inhabiting OU3, surveys will be conducted annually for the next 4 years per the BEMP schedule. The 2004 results are limited (first of 5 years) and will be integrated into the final report.

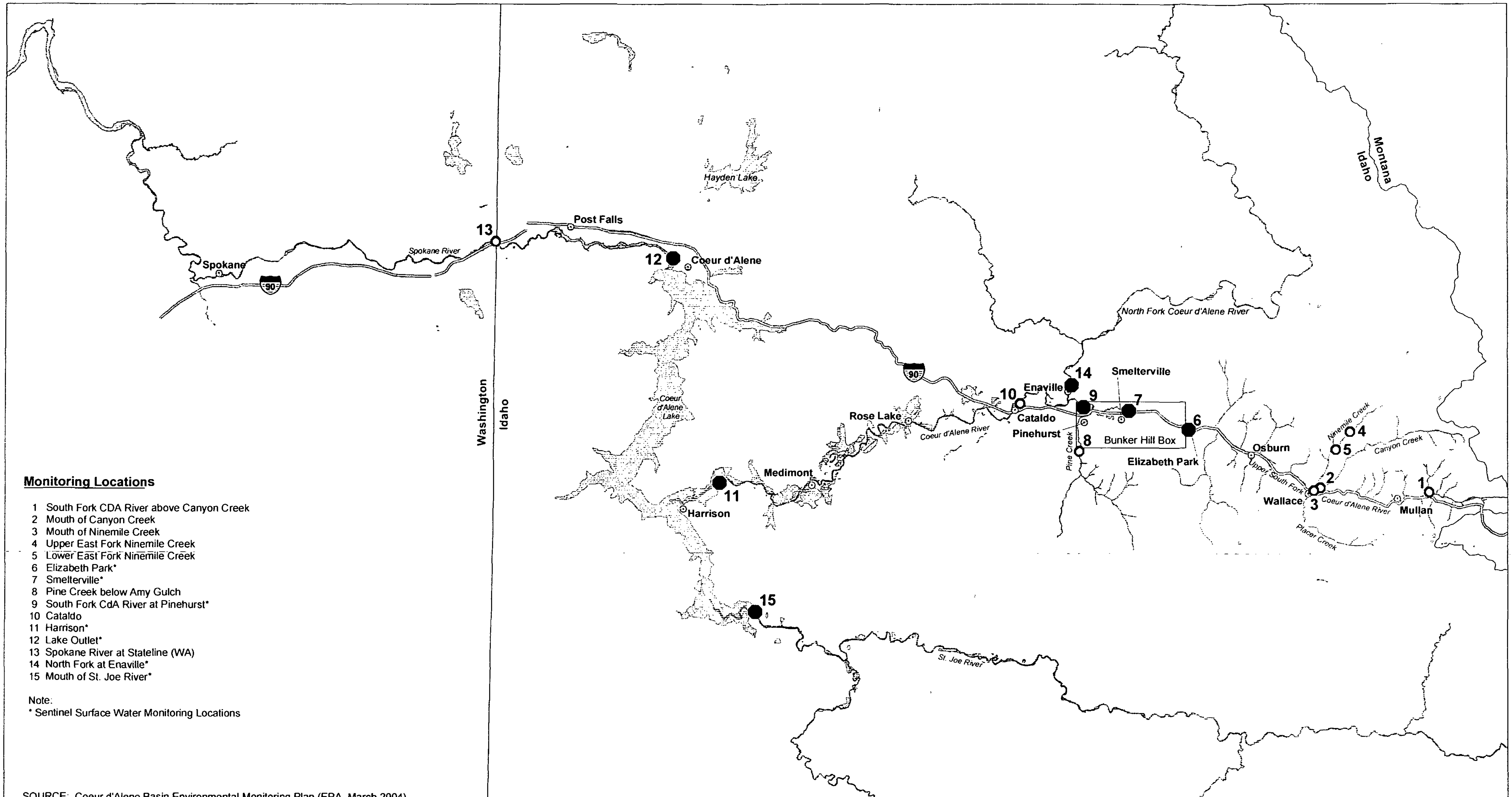
The surface water monitoring portion of the BEMP was conducted by the USGS during WY2004, which encompassed October 1, 2003, through September 30, 2004. The seven sentinel stations, listed in Table 5-59, were sampled on a hydrograph-oriented basis in order to obtain water quality data representative of a wide range of flow conditions. Flows were measured and water quality samples were collected at the sentinel stations under the following flow conditions: early fall base-flow, initial fall flush, winter base-flow, early spring rain-on-snow event, spring snowmelt runoff, and summer hydrograph recession during June through August. Additionally, the eight benchmark stations, listed in Table 5-59, were sampled in early October 2003, in conjunction with sampling at the sentinel stations, in order to compare dissolved-metal concentrations among the 15 stations during early fall base-flow conditions. The analytical results for WY2004 sampling at the 15 stations are available in the USEPA's STORET data repository.

Flow conditions during WY2004 were only 74 percent of long-term mean flow conditions in the Coeur d'Alene Basin, as measured at the USGS gaging station on the Coeur d'Alene River at Cataldo, which has a period of record from 1911-2004. Flow conditions in the previous water year, 2003, were even lower, being only 72 percent of normal. The range of sampled flows during WY2004 at the seven sentinel stations was from 61 cfs at SF-268 (Elizabeth Park) to 13,400 cfs at SR-5 (lake outlet).

Water quality samples at the seven sentinel stations included total and dissolved concentrations of cadmium, lead, and zinc. The minimum, maximum, and median concentrations for these three trace elements are listed in Table 5-60. Median concentrations of total and dissolved cadmium both ranged from <0.04 to 8.4 μg/L. Median concentrations of total lead ranged from 0.11 to 16.0 μg/L; the range for dissolved lead was 0.05 to 4.1 μg/L. For total and dissolved zinc, median concentrations ranged, respectively, from less than 2 to 1,100 μg/L and from 0.74 to 1,145 μg/L. Among the seven stations, the smallest median concentrations of the three trace elements were measured at NF-50 (Enaville) and SJ-60 (Chatcolet); SF-270 (Smelterville) had the largest median concentrations, except for total lead, which was largest at LC-60 (Harrison).

Phosphorus, nitrogen, and suspended sediment concentrations were also sampled at the seven sentinel stations during WY2004; minimum, maximum, and median concentrations are listed in Table 5-60. Median concentrations of total phosphorus and nitrogen ranged, respectively, from 3.4 to 27 μg/L and from 56 to 286 μg/L. The largest median concentrations of the two nutrients were measured at SF-271 (Pinehurst), whereas the smallest median concentrations were measured at NF-50 (Enaville). Median concentrations of suspended sediment ranged from 1 to 5; SF-271 had the largest concentration.

The seven sentinel and eight benchmark stations (Table 5-60) were sampled for flow and dissolved metal concentrations during early fall base-flow of WY2004. Flows among the 15 stations ranged from 1.4 cfs (NM-295) to 1,100 cfs (SR-5 and SR-55). Dissolved cadmium concentrations ranged from 0.033 (SF-208) to 29.8 μg/L (NM-298). Dissolved




**Monitoring Locations**

1 South Fork CDA River above Canyon Creek
2 Mouth of Canyon Creek
3 Mouth of Ninemile Creek
4 Upper East Fork Ninemile Creek
5 Lower East Fork Ninemile Creek
6 Elizabeth Park*
7 Smelterville*
8 Pine Creek below Amy Gulch
9 South Fork CdA River at Pinehurst*
10 Cataldo
11 Harrison*
12 Lake Outlet*
13 Spokane River at Stateline (WA)
14 North Fork at Enaville*
15 Mouth of St. Joe River*

Note:
* Sentinel Surface Water Monitoring Locations

SOURCE: Coeur d'Alene Basin Environmental Monitoring Plan (EPA, March 2004)

**Legend**

- O Benchmark Surface Water Monitoring Location (5-Year Intervals)
- ● Sentinel Surface Water Monitoring Location (Annual)
- —— Water Features
- ☐ Bunker Hill Box
- ⊙ City
- ═ I-90

N

0 6 12 Miles

FIGURE 5-12

**BEMP MONITORING LOCATIONS**
**BUNKER HILL SUPERFUND SITE**

FIVE-YEAR REVIEW

File Path: Z:\USEnvironmentalProte\321104\GIS\MapDocuments\Mxds\5-Year Review\Figure 5-12.mxd

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**Table 5-59. Statistical Summary of Flow, Trace Elements, Nutrients, and Suspended Sediment Sampled During Water Year 2004 at BEMP's Seven Sentinel Stations**

| Variable and units | Statistic | USEPA BEMP Sentinel Station ID and Name | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | SF-268 SFCDR Eliz. Park | SF-270 SFCDR Smelterville | SF-271 SFCDR Pinehurst | NF-50 NFCDR Enaville | LC-60 CDR Harrison | SJ-60 SJR Chatcolet | SR-5 SR Lake Outlet |
| Instantaneous flow (cfs) | Min. | 61 | 63 | 88 | 182 | 436 | 418 | 645 |
| | Max. | 934 | 941 | 1,260 | 6,250 | 7,350 | 6,870 | 13,400 |
| Cadmium, total (µg/L) | Median | 6 | 8.4 | 6.1 | 0.02 | 1 | <0.04 | 0.21 |
| | Min. | 2.2 | 2.8 | 2.5 | <0.04 | 0.79 | <0.04 | 0.12 |
| | Max. | 7.1 | 14.8 | 17.4 | 0.03 | 1.5 | <0.04 | 0.31 |
| Cadmium, dissolved (µg/L) | Median | 5.9 | 8.4 | 6.1 | <0.04 | 0.9 | <0.04 | 0.18 |
| | Min. | 1.9 | 2.4 | 2.2 | <0.04 | 0.77 | <0.04 | 0.09 |
| | Max. | 7.1 | 13.3 | 9.2 | 0.03 | 1.3 | <0.04 | 0.25 |
| Lead, total (µg/L) | Median | 7.2 | 14 | 9 | 0.14 | 16.9 | 0.11 | 0.99 |
| | Min. | 4.5 | 8.9 | 7.1 | 0.04 | 8.4 | 0.05 | 0.57 |
| | Max. | 65.5 | 80 | 89.7 | 1.23 | 88.5 | 0.24 | 1.55 |
| Lead, dissolved (µg/L) | Median | 2.7 | 4.1 | 3.4 | 0.08 | 3.3 | 0.05 | 0.14 |
| | Min. | 1.3 | 2.4 | 1.2 | <0.08 | 2.5 | <0.08 | 0.09 |
| | Max. | 4.2 | 9.8 | 4.2 | 0.17 | 5.7 | 0.08 | 0.35 |
| Zinc, total (µg/L) | Median | 860 | 1,100 | 890 | 3.2 | 176 | <2 | 55 |
| | Min. | 317 | 415 | 388 | 2.1 | 127 | <2 | 28 |
| | Max. | 960 | 1500 | 1,430 | 6 | 293 | 2.8 | 72 |
| Zinc, dissolved (µg/L) | Median | 680 | 1,145 | 831 | 3.2 | 162 | 0.74 | 53 |
| | Min. | 300 | 394 | 368 | 2.5 | 101 | <0.6 | 26 |
| | Max. | 991 | 1,470 | 1,408 | 6.9 | 267 | 2.5 | 69 |
| Phosphorus, total (µg/L) | Median | 4.9 | 22.2 | 27 | 3.4 | 6.4 | 12.9 | 5.8 |
| | Min. | <4 | 10.6 | 13.2 | <4 | 2 | 9.7 | 3.7 |
| | Max. | 13.2 | 70.5 | 277 | 14.3 | 15.7 | 19.5 | 7.1 |
| Nitrogen, total (µg/L) | Median | 155 | 150 | 286 | 56 | 88 | 95 | 150 |
| | Min. | 55 | 61 | 104 | <30 | 44 | 40 | 49 |
| | Max. | 372 | 482 | 724 | 92 | 196 | 196 | 184 |
| Sediment, suspended (mg/L) | Median | 2 | 4.5 | 5 | 1 | 2 | 3 | 1 |
| | Min. | 0 | 1 | 0 | 0 | 1 | 2 | 0 |
| | Max. | 12 | 20 | 28 | 10 | 14 | 7 | 2 |

**Table 5-60. Flow and Dissolved Concentrations of Cadmium, Lead, and Zinc Sampled During October of Water Year 2004 at BEMP's Seven Sentinel and Eight Benchmark Stations**

| USEPA Station ID and Name | Instantaneous flow (cfs) | Cadmium (µg/L) | Lead (µg/L) | Zinc (µg/L) |
|---|---|---|---|---|
| SF-208, SFCDR, Deadman | 10.4 | 0.033 | 0.94 | 18.6 |
| CC-287, CC, Mouth | 11.6 | 14.9 | 15 | 2,170 |
| NM-295, EFNM, abv. Success | 1.44 | 11.1 | 10 | 2,020 |
| NM-298, EFNM, Mouth | 2.02 | 29.8 | 52.6 | 5,210 |
| NM-305, NM, Mouth | 4.78 | 20.8 | 20 | 3,280 |
| SF-268, SFCDR, Eliz. Park | 61.2 | 7.1 | 3.7 | 936 |
| SF-270, SFCDR, Smelterville | 63.4 | 10.6 | 9.8 | 1,225 |
| PC-339, PC, Amy Gulch | 11.6 | 0.37 | 0.43 | 111 |
| SF-271, SFCDR, Pinehurst | 88 | 9.2 | 5.2 | 1,410 |
| NF-50, NF, Enaville | 182 | <0.04 | <0.08 | 2.9 |
| LC-50, CDR, Cataldo | 376 | 1.92 | 1.44 | 347 |
| LC-60, CDR, Harrison | 436 | 1.3 | 2.5 | 267 |
| SJ-60, SJR, Chatcolet | 418 | <0.04 | 0.06 | 1 |
| SR-5, SR, Lake outlet | 1,100 | 0.12 | 0.09 | 38.3 |
| SR-55, SR, ID/WA Border | 1,100 | 0.057 | 0.182 | 24 |

lead concentrations ranged from 0.06 (SJ-60) to 52.6 µg/L (NM-298). Dissolved zinc concentrations ranged from 1 (SJ-60) to 5,210 µg/L (NM-298). Among the 15 stations, East Fork of Ninemile Creek at its mouth had the highest dissolved metal concentrations.

The Basin long-term environmental monitoring has just recently begun implementation with WY 2004 (October 2003). While data available at this writing are presented in this report, limited results are available at this time from the first year of data collection. Given the short period of record and limited availability of analytical results, the USEPA anticipates doing a comprehensive analysis of the data results in the next five-year review report.

#### 5.6.1.6 BEMP Data Management

Environmental monitoring data collected under the BEMP and for OU2 will be managed in a centralized database. Human-health-related data will not be included in this database. Environmental data are a strategic, long-term asset that require a data management system that is stable, accessible, credible, and cost-effective. STORET is the USEPA's web-based repository for historic and future water quality, biological, and physical data. The system is used by states, tribes, the USEPA and other federal agencies, universities, and citizens to access the nation's environmental monitoring data. To manage environmental data collected at the Site, the USEPA has established a section of STORET that includes historical Site data and has the capacity for future data. The USEPA Region 10 has selected STORET as the data management system because it is the USEPA's environmental data system; it is a non-proprietary system and is a cost-effective way to manage the considerable Site data. The region has worked cooperatively with experts in USEPA Region 8 and Headquarters to develop the site-specific STORET website (www.storet.org). The USEPA Region 10 staff and contractors have developed a Coeur d'Alene-specific user-friendly map-based "front-end" application to access data in the national STORET database, using ArcIMS software. ArcIMS applications allow for the viewing and querying spatial data. The tools provide functions for changing the map display features, querying the spatial and analytical data, and performing spatial analysis.

Currently the Site environmental monitoring data for surface water, soil, and sediment for the Site are included on www.storet.org. A future growth area for the data management system is to include the biological data. These analytical reports will be made available on the USEPA's website for the Superfund Site and will be provided upon request.

#### 5.6.1.7 Adaptive Management and Future Five-Year Reviews

The 2002 OU3 ROD calls for an adaptive management framework for remedy implementation. The environmental monitoring under the BEMP is anticipated to evolve over the 30-year interim remedy implementation. The BEMP will be modified as necessary to reflect a better understanding of Basin processes and changes in monitoring tools and techniques. The five-year data analysis and assessment reports will be a key component of the adaptive management review of the progress made under the 2002 OU3 ROD. Specific components include detection of trends or major trend discontinuities, which may signal a need to update critical assumptions or change management practices and/or adjust the monitoring plan. These evaluations and the experience gained from remedy implementation may help identify and guide "course corrections" that improve remedy performance or cost-effectiveness.

The BEMP assumes that extensive analysis of accumulated monitoring data will be conducted at five-year intervals timed to support future five-year remedy reviews. In addition to data collected under the BEMP, the five-year review data analyses may incorporate data collected as part of remedial-action-specific monitoring or other monitoring programs in the Basin (i.e., Lake Environmental Monitoring Plan data). The five-year analyses and assessments will be documented in BEMP technical memoranda, which will be used to support the future five-year remedy reviews.

Remedial action performance will be evaluated, in part, by comparing the long-term monitoring data to the benchmarks of the remedy. The monitoring hypotheses for this monitoring program have been developed to answer questions relating to progress toward benchmarks of the remedy, where possible, and the timing of monitoring events will be selected with consideration of five-year review data needs. Effectiveness monitoring data will be used to complement the long-term monitoring data during five-year review evaluations.

#### 5.6.1.8 Technical Assessment of OU3 Basin Environmental Monitoring Plan

Per USEPA guidance (USEPA, 2001e), technical assessment of the BEMP actions was conducted by evaluating the following three questions related to protectiveness of the implemented actions:

### *Question A: Is the remedy functioning as intended by the decision documents?*

The BEMP is functioning as intended by the decision documents. The BEMP was collaborative developed within the Basin Commission and approved by the Commissioners in a unanimous vote. BEMP implementation began with WY 2004 with USEPA funding. Resultant surface water and soil/sediment data will be made available via a web-accessible data management system (www.storet.org).

### *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?*

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the implementation of the BEMP. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

### *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

The BEMP has only been implemented for a short period and this five-year review did not find any new information that calls into question the protectiveness of the BEMP.

### *Remedy Issues*

**Table 5-61. Summary of BEMP Issues**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| None | -- | -- |

### *Recommendations*

**Table 5-62. Summary of BEMP Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Continue Implementation:** Continue implementation of the BEMP. | USEPA | USEPA | Ongoing | N | Y |

## 5.6.2 Remedial Action Effectiveness Monitoring

OU3 action-specific effectiveness monitoring has been addressed by remedial action area (e.g., tributaries, river reaches, etc.). The purpose of the effectiveness monitoring is to assess the success and effect of a given remedial action. By comparison, the BEMP will address basin-wide status and trends by monitoring a limited number of strategic locations (USEPA, 2004). Both the remedial-action-specific effectiveness and long-term monitoring plans will be integrated by coordinating monitoring to generate comparable data (same timeframe or synoptic) and using common sampling locations, where possible. RA effectiveness monitoring, while not detailed in the BEMP, will incorporate similar monitoring hypotheses as those included in the BEMP. The adaptive management approach will maximize the utility of effectiveness monitoring data through comparison of results to expectations.

RA effectiveness monitoring in OU3 will be included in the designs and implementation plans for ecological-related remedial actions. RA effectiveness monitoring will be implemented at the human health-related remedial actions recently implemented at the East of Rose Lake Boat Launch and Highway 3/Trail of the Coeur d'Alenes Crossing site (see Section 5.4 of this document).

### Technical Assessment of OU3 Remedial Action Effectiveness Monitoring

Per USEPA guidance (USEPA, 2001e), technical assessment of the OU3 Remedial Action Effectiveness Monitoring was conducted by evaluating the following three questions related to protectiveness of the implemented actions:

#### *Question A: Is the remedy functioning as intended by the decision documents?*

Since implementation of the 2002 OU3 ROD has just begun and limited remedial actions have been implemented to date, the RA effectiveness monitoring has just begun; to date it is functioning as intended by the decision documents.

#### *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?*

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the implementation of RA effectiveness monitoring. See Section 5.2 for a summary review of the 2002 OU3 ROD ARARs, and new or revised standards that have been issued since 2002.

#### *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

Remedial action effectiveness has only been implemented for a short time and this five-year review did not find any new information that calls into question the protectiveness of the monitoring.

#### *Remedy Issues*

**Table 5-63. Summary of Remedial Action Effectiveness Monitoring Issues**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| None | -- | -- |

### *Recommendations*

Table 5-64. Summary of Remedial Action Effectiveness Monitoring Recommendations and Follow-Up Actions

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) Current (now to 1 year) | Future (>1 year) |
|---|---|---|---|---|---|
| **Continue Implementation:** Continue implementation of remedial action effectiveness monitoring at recreational areas and include RA effectiveness monitoring in the designs and implementation plans for ecological-related remedial actions. | USEPA and/or implementing entity | USEPA | Ongoing | N | N |

# 5.7 Coeur d'Alene Lake

Coeur d'Alene Lake encompasses 49.8 square miles at its normal full-pool elevation (2,128 feet above sea level, Avista datum) with a maximum water depth of 209 feet. At high flows, the lake elevation is controlled by the natural constriction in the channel at the outlet of the lake. The lake's principal tributaries are the St. Joe River and the Coeur d'Alene River. The lake has a drainage area of 3,741 square miles. The discharge from the lake forms the Spokane River. The lake is a natural lake, but its elevation is controlled by the Post Falls Dam. A large volume of metals-contaminated sediment has been deposited on the lake bottom.

During early investigations in 1998, the beaches and wading areas adjacent to the lake were found to be safe. The only exceptions were Harrison City beach which has been remediated as part of the Union Pacific Railroad removal action and Blackwell Island located at the mouth of the Spokane River.

The 2002 OU3 ROD does not include a remedy for Coeur d'Alene Lake. This decision was deferred pending the development and effective implementation of a revised Lake Management Plan (LMP). The revised LMP is a multi-jurisdictional, non-Superfund plan to effectively contain and prevent mobilization of metals from lakebed sediments to protect water quality. The Coeur d'Alene Tribe and the State of Idaho are currently developing this revised LMP. As part of this revised LMP, a Lake Environmental Monitoring Plan (LEMP) is being implemented to assess nutrients, sediments, and metal trends to monitor the water quality and ecological health of the lake. As stated in the 2002 OU3 ROD, evaluation of lake conditions will be included by the USEPA in future five-year reviews.

## 5.7.1 Lake Management Plan

An extensive water quality study was initiated in 1991 by the IDEQ, the Coeur d'Alene Tribe, and the USGS in response to long-term concerns over water quality degradation in Coeur d'Alene Lake. These concerns resulted from observed increases in nutrients which resulted in increased plant growth, decreases in water clarity, and heavy metals contamination found in lakebed sediments. The study had three objectives:

1. Determine the lake's ability to receive and process nutrients (phosphorus and nitrogen) in order to devise measures that will prevent water quality degradation;

2. Determine the potential for releases of heavy metals from lake bed sediments into the overlying lake water; and

3. Develop information to support a lake management plan that will identify actions needed to meet water quality goals.

Upon completion of the 1991-92 water quality study, a Coeur d'Alene LMP was developed by the Clean Lakes Coordinating Council (CLCC), the IDEQ, and the Coeur d'Alene Tribe to address water quality issues identified in the study. The LMP was completed in 1995 and adopted in 1996 (CLCC et al., 1996). The main focus of the lake management strategy was to effectively manage nutrients and reduce upstream metals loads to reduce the releases of metals to the water column from lakebed sediments.

In 1998, the USEPA began a RI/FS under its CERCLA program to investigate contamination outside the Bunker Hill Box (OU1/OU2). In September 2002, the USEPA issued the OU3 ROD detailing strategies for cleanup throughout the rest of the Coeur d'Alene and Spokane River basins. As part of this ROD, the USEPA implemented a fish consumption study in Coeur d'Alene Lake (discussed in Section 5.5.1.10 of this report).

The 2002 OU3 ROD does not include a remedy for Coeur d'Alene Lake; however, the ROD recognized the need for a revised LMP. The Coeur d'Alene Tribe and the State of Idaho agreed to undertake developing a joint, revised LMP, and pending the outcome of this effort and the effective implementation of this revised plan, the USEPA deferred all final remedial decisions for the lake. In the meantime, as stated above, the USEPA will continue to evaluate lake conditions in future five-year reviews.

### 5.7.1.1 Revising the 1996 LMP

Revisions to the initial 1996 LMP are required for a number of reasons, including new information gathered during the OU3 RI/FS (USEPA, 2001b and 2001c) and the recent lake fish consumption study results, inclusion of an environmental monitoring plan, recent legal and regulatory decisions, and initiation of basin-wide remedial actions. All of these events have impacted the appropriateness and effectiveness of the 1996 LMP. Development of a revised LMP commenced in 2002, but has not yet been finalized by the Tribe and the State. So far, the analysis has produced the following conclusions and recommendation.

#### *Conclusions*

1. General monitoring results indicate lake water quality remains good for nutrients, water clarity, and dissolved oxygen. Dissolved oxygen generally meets state and tribal standards. In deeper sections within the southern one-third of the lake, dissolved oxygen can become depleted to near zero in bottom-most waters.

2. Dissolved zinc exceeds state, tribal, and federal water quality criteria by twofold. Lead concentrations have exceeded drinking water standards during high flows. Lakebed sediment pore-water studies suggest that metals continue to flux into and out of solution within the sediment and in the water immediately overlying the sediment. Zinc concentrations suppress algae production in the lake.

3. Stakeholders and agencies generally agree that further implementation of the LMP is needed to protect and restore lake water quality.
4. There has been no dedicated staffing to oversee and coordinate LMP implementation work, and a detailed audit of the work accomplished, as set forth in the 1996 LMP Management Action Tables, has not been fully completed.
5. There is no dedicated source to adequately fund implementation of lake restoration and protection measures.
6. There is no long-term lake water quality monitoring program to adequately track water quality trends.

### *Recommendation*

Protection of a shared and valued lake resource can result if the Tribe and the IDEQ are able to reach consensus through promoting collaborative development and implementation of a multi-party LMP that transcends political boundaries. Examples of obstacles to accomplishing a consensus LMP include:

- Funding for additional staffing to coordinate implementation;
- Funding to implement nutrient reduction projects; and
- Funding for long-term monitoring to track lake conditions and response to implementation activities.

Although funding is, and will remain, an obstacle, the Tribe and the State have committed to developing a revised, joint LMP. Both governments agree that by completing an effective LMP, they will be in a better position to obtain funding for its implementation. Towards that end, the Tribe appointed a Coeur d'Alene Lake program manager, and the 2005 Idaho Legislature approved funding for an IDEQ staff position focused on LMP development. In addition, the USEPA has provided financial support for the development of a revised LMP, and has worked with the Tribe and the State to secure mediation support to finalize an effective, multi-party LMP. The USEPA, the Coeur d'Alene Tribe, and the State of Idaho recognize the community interest to implement lake management activities as non-CERCLA actions and the desire expressed by many in the community to eventually delete the lake from the Bunker Hill Superfund Site.

The USEPA could make a determination that the revised LMP has eliminated the need for further Superfund cleanup actions in the lake, and propose a "no further CERCLA action" (NFA) remedy. There are several steps leading up to this NFA decision including:

- Implementation of source cleanup actions upstream of the lake to reduce metal loading to the lake system;
- Provisions in the revised LMP that effectively protect the water quality of the lake when implemented. This includes an environmental monitoring plan; and
- Assurance that the revised LMP has been adopted by state, tribal, and local governments, and that these governments have made a commitment to implement the revised LMP over time.

After proposing a NFA remedy decision, the USEPA would then issue a NFA ROD for the lake. This would be followed by a proposal for partial deletion of the lake from the Superfund Site, followed by a final partial deletion rule-making.

Although the collective governments recognize the desire for partial deletion, their main concern is developing a revised, consensus-driven LMP that will manage contaminated sediments and protect lake water quality. Effectively implementing the revised LMP is a critical step toward deleting the lake from the Superfund Site. If consensus cannot be reached on development and effective implementation of a revised LMP, the USEPA will consider other available options.

## 5.7.2 Coeur d'Alene Lake Environmental Monitoring Plan

Monitoring and evaluating the water quality and ecological health of the lake is an integral part of successfully implementing the LMP. In 2003, Clean Water Act funds were provided to the Coeur d'Alene Tribe and the USFWS to oversee development and initiation of a 3-year LEMP.

### 5.7.2.1 Limnological Monitoring

Limnological monitoring is being conducted by both the Coeur d'Alene Tribe and the USGS. The purpose of this monitoring project is to:

- Evaluate the interaction of metals, nutrients, and biological productivity in Coeur d'Alene Lake during water years 2004 through 2006;
- Identify potential changes or trends in lake water quality conditions (compared to the studies by the IDEQ, the USGS, and the Coeur d'Alene Tribe in the early 1990s) that may have occurred as a result of environmental remediation elsewhere in the Basin (as well as from other environmental and human-caused factors); and
- Provide the technical information needed for a long-term lake management plan capable of preventing potential release of toxic metals from lakebed sediments induced by increased nutrient loading and lake eutrophication or by unforeseen consequences of upstream remedies.

In addition to identifying changes in water quality conditions that may have occurred over approximately the past decade, data from this project largely will be used for developing sophisticated predictive models of lake water quality and potential mobility of metals out of lakebed sediments in response to nutrient inputs to the lake. These models, to be developed subsequently by the USGS and university researchers, will be at the core of efforts needed to manage lake water quality for the long term.

Data collected for the 2004 WY (October 2003 to September 2004) are now available in the USGS annual data report for the State of Idaho. Initial inspection of these data indicates higher chlorophyll concentrations at both pelagic and littoral sites for comparable dates sampled a decade ago. This finding indicates an overall increase in lake productivity, even though nutrient (nitrogen and phosphorus) concentrations did not appear substantially higher. A possible explanation relates to a noticeable decrease in zinc concentrations in the euphotic zone (upper waters), allowing for increased phytoplankton production.

Preliminary indications are that chlorophyll concentrations (and therefore overall lake biological productivity) may be double those of a decade ago.

The protocol for sampling movement of metals out of the lakebed sediments (benthic flux) has evolved. Through redesign and testing, the equipment and protocol yielded undisturbed samples of the 6 inches of water overlying the lakebed sediments in the May and June samples.

#### 5.7.2.2 Ecological Health Monitoring

The 2002 OU3 ROD (USEPA, 2002a) states that a Coeur d'Alene LMP will be developed that includes monitoring activities. Health of ecological receptors must be evaluated to ensure the protection of ecological receptors through lake management. Clean Water Act grants were awarded to the USFWS to develop baseline conditions for ecological receptors using Coeur d'Alene Lake; this information is necessary to determine current and future changes in the ecological condition of the lake. The primary ecological receptors of concern in the lake include the federally threatened bull trout, migratory birds, and fish in general. Evaluation studies developed include:

- An evaluation of waterfowl health through an assessment of blood lead concentrations in waterfowl blood and an assessment of sediment lead concentrations in waterfowl feeding areas;
- An evaluation of metal residues in whole fish as a baseline of metal exposure; and
- An evaluation of bull trout health based on water quality parameters collected by other parties from the lake.

The USFWS began baseline ecological receptor health evaluation fieldwork in 2004 by collecting sediment, waterfowl blood, and waterfowl fecal samples in lake and reference locations. Fifty-six palustrine samples were collected from eleven Coeur d'Alene Lake and two reference locations. One hundred and two lacustrine samples were collected from twenty-two Coeur d'Alene Lake and two reference locations. Sixty-one blood samples were collected from mallards and wood ducks from eight Coeur d'Alene Lake locations and one reference location. Nineteen Canada goose fecal samples from five locations and three mallard samples from one location were collected for sediment concentration analysis. Preliminary data suggest that sediment lead concentrations in waterfowl use areas are above the OU3 ROD sediment cleanup. Results are currently being analyzed. Future ecological health evaluation work includes collection of fish in summer 2005 for metal exposure analysis and the completion of the bull trout health evaluation.

### 5.7.3 Technical Assessment of OU3 Coeur d'Alene Lake

Per USEPA guidance (USEPA, 2001e), technical assessment of the OU3 Coeur d'Alene Lake was conducted by evaluating the following three questions related to protectiveness of actions to be implemented.

***Question A: Is the remedy functioning as intended by the decision documents?***

A decision on a remedy was deferred by the USEPA pending the revision and adoption of an LMP which would serve as the management tool for protecting the lake from increased nutrient enrichment and the possible metals mobilization from contaminated bottom sediments. Development of a revised LMP commenced in 2002, but has not yet been finalized by the Coeur d'Alene Tribe and the State of Idaho. As a result, the USEPA has decided to seek mediation in support of this issue.

***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?***

Since no remedy was selected, this question does not apply.

***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

Recent data collected by the USGS indicate lake productivity has doubled over the last 10 years. A lake model is being developed, which can predict how changes in metals and nutrient loadings to the lake can impact the flux of metals from lake bed sediments. In addition, development along the lake shore continues to increase, therefore increasing the possibility for accelerated nutrient inputs.

*Remedy Issues*

**Table 5-65. Summary of Coeur d'Alene Lake Issues**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **Lake Eutrophication:** Control of lake eutrophication and potential release of metals from contaminated sediments. | Y | Y |

*Recommendations*

**Table 5-66. Summary of Coeur d'Alene Lake Recommendations and Follow-Up Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Lake Eutrophication:** Complete Lake model. | Coeur d'Alene Tribe, USGS | USEPA | 12/2006 | Y | Y |
| **Lake Management Plan:** Complete and initiate Lake Management Plan. | Coeur d'Alene Tribe, State of Idaho | USEPA | 4/2006 | N | Y |

# 5.8 UPRR Removal Action (Trail of the Coeur d'Alenes)

## 5.8.1 Decision Document

The UPRR Company has completed the CERCLA removal action for its Wallace-Mullan Branch ROW located in OU3. The elements of the removal action were selected based on the analysis of alternatives presented in the UPRR Wallace-Mullan Branch EE/CA (USEPA, 1999c). The EE/CA was prepared in accordance with the NCP and the USEPA's *Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA* (USEPA, 1993). The range of alternatives presented in the EE/CA included: No Action, ICs, Protective Barriers, Removal and Disposal/Consolidation, or Treatment. Removal and Disposal/Consolidation alternative was the preferred alternative.

In October 1999, the USEPA Region 10 Environmental Cleanup Director signed an Action Memorandum, which was the over-arching decision document for this action (USEPA, 1999a). This Action Memorandum, coupled with the parties' willingness to negotiate a settlement agreement,[10] provided an administrative tool to effectively implement this cleanup action more than 2 years before the release of the 2002 OU3 ROD. Being able to move this cleanup action forward effectively and efficiently with settlement funds preserved precious federal resources and optimized cleanup efforts elsewhere at the Site.

The goals of the removal action were to effectively address mine waste-related contamination within the ROW in a manner that was protective of human health and the environment and in compliance with ARARs, to the extent practicable. The mine waste included jig and flotation tailings, waste rock, concentrates, and ores, all of which were derived from mining activities. These goals led to a removal action objective of minimizing the potential for direct exposure to mine waste and limiting the potential for the environmental transport of contaminants.

## 5.8.2 Background and Description of Actions

### 5.8.2.1 Introduction

The Wallace-Mullan Branch removal action represented a distinctive environmental project. The project resolved historical mining-related environmental issues and returned the site to a beneficial use by creating an economic benefit for local communities through the building of a recreational trail. The conversion of the ROW for use as a recreational trail was accomplished under the National Rails-to-Trails Act with the issuance of a Certificate of Interim Trail Use (CITU) by the Surface Transportation Board (STB). The recreational trail serves as a key component of the project by facilitating the implementation of the removal action.

The removal action addressed the main line and related sidings of the Wallace-Mullan Branch ROW. The 7.9-mile section of the ROW within OU2 was previously addressed as part of the 1992 OU2 ROD (USEPA, 1992), and was excluded from this removal action. Section 4.3.10 reviews the segment of the rail-line within OU2. Several other areas were not addressed under the removal action in accordance with the CD. Those areas are: any spurs or connecting branch lines outside of the Wallace-Mullan ROW; non-siding areas of the Wallace Yard outside a 26-foot-wide corridor bracketing the main line; and areas of the Hecla Mine tailings impoundment and the Morning Mine waste rock dump that may encroach on the ROW. These areas will be addressed separately.

### 5.8.2.2 Pre-Remedy Contamination

The ROW passes through a wide variety of settings, terrain, and conditions. Through approximately 80 percent of its length, the ROW generally follows the Coeur d'Alene River and is mostly within the flood plain. For the remaining 20 percent of its length, the ROW is

[10] Consent Decree; United States of America and State of Idaho v. Union Pacific Railroad Company; Coeur d'Alene Tribe v. Union Pacific Railroad Company, et al.;. Case Nos. CV 99-0606-N-EJL and CV 91-0342-N-EJL; December 23, 1999.

adjacent to Coeur d'Alene Lake or in the upland areas of the Coeur d'Alene Indian Reservation. These various settings can generally be characterized into three sections:

- The upper South Fork of the Coeur d'Alene River Basin (the Upper Basin) which includes the western portion of the Mullan Branch extending from Mullan (Mullan Branch Milepost [MP] 7) to Wallace (Mullan Branch MP 0) and the easternmost portion of the Wallace Branch extending from Wallace (Wallace Branch MP 80) to west of Enaville (Wallace Branch MP 62);
- The lower Coeur d'Alene River Basin (the Lower Basin) starting downstream of the confluence of the South and North Forks of the Coeur d'Alene River west of Enaville (Wallace Branch MP 62) to Harrison (Wallace Branch MP 31); and
- The east shoreline of Coeur d'Alene Lake beginning at Harrison and the upland rolling hills west of Coeur d'Alene Lake to Plummer Junction (Wallace Branch MP 16).

The rail line was constructed in the late 1800s to serve the mining industry in the Silver Valley. In some locations, the line was constructed on top of an existing mantle of fluvially deposited tailings, and in other areas mine waste rock was used as fill material to elevate the line above the river level. Tailings and waste rock were also used as a component of the rail bed ballast throughout the length of the line. The EE/CA reported that approximately 168,000 cubic yards of ballast was placed along the rail bed as part of the original construction. This original ballast material consisted of a mixture of tailings, waste rock, and locally available gravels. The EE/CA found that most of this original ballast was still in place, isolated by the track structure and non-contaminated ballast material that had been placed as part of track maintenance activities during the active life of the line. In the Upper Basin, waste rock and tailings were used as fill to construct portions of the railroad subgrade. In the Lower Basin, subgrade materials were primarily obtained from local quarries.

The rail line primarily served the mining industry in the Silver Valley, transporting ores and concentrates to and from the mines and mining process facilities. At various locations along the rail line, and in particular at sidings and loading/unloading areas, there was evidence of spillage of these ores and concentrates (which have higher concentrations of lead and other heavy metals than the tailings and waste rock).

According to the 2002 OU3 ROD, an estimated 62 million tons of tailings were discharged to streams within the Coeur d'Alene Basin prior to 1968. Most of the tailings were transported downstream, particularly during high flow events, and deposited as lenses of tailings or as tailings/sediment mixtures in the bed, banks, floodplains, and lateral lakes of the Upper Basin and Lower Basin and in Coeur d'Alene Lake. The 2002 OU3 ROD estimated that the total mass and extent of impacted materials (primarily sediments) exceeded 100 million tons dispersed over thousands of acres.

Analytical data from representative soil sampling along the ROW verified the existence of tailings in the floodplain, including a layer beneath the railroad subgrade embankment in some locations. The data also confirmed the use of tailings and waste rock in the original ballast and portions of the subgrade embankment in the Upper Basin.

### 5.8.3 Removal Actions

The objective of the removal action, as stated within the EE/CA, was to minimize the potential for direct exposure to mine waste and limit the potential for the environmental transport of contaminants. This objective was accomplished through the implementation of various work elements that were defined in the CD's Statement of Work (SOW). A listing and brief description of these work elements is provided below.

**Salvage of the Rail, Ties and Other Track Materials:** This element of work represented the removal of the rail and track structure. The work was performed in accordance with the procedures described in the Track Salvage Work Plan, Attachment A to the CD SOW. The work consisted of the removal, decontamination, and salvage of useable railroad ties and track. Non-salvageable material was decontaminated and disposed of at properly permitted, offsite facilities.

**Flood Damage Repair:** This element of work was performed in accordance with the Flood Damage Repair Work Plan (FDR Work Plan), Attachment B to the CD SOW. This work involved the repair of flood-damaged portions of the rail bed embankment, scour damage, and removal of flood debris impinging on bridge structures. The objective of this work was to maintain the integrity of the railroad grade for use as a recreational trail and to mitigate the future migration of contaminants from the ROW. A component of this element of work prescribed re-installation of culverts which had been washed out. However, the UPRR, subsequent to negotiation of the CD, agreed to design and install culverts in Shingle and O'Gara bays to better allow natural flows and connectivity between the lake and the bays on the upland side of the UPRR embankment. The inverts of the bridge channels were designed to be a more wildlife friendly elevation than the culverts they replaced.

**Removals, Disposal, and Protective Barriers:** This element of work included the isolation of mine waste materials from certain potential exposure pathways through removal and disposal as well as the placement of protective barriers. The components of this element of work are more fully described in the Removals, Disposal, and Protective Barriers Response Action Work Plan (Attachment C to the CD SOW) and the related Response Action Design Drawings (RAD Drawings) (Attachment D to the CD SOW).

**Trail:** After implementation of the removal action, the ROW will be utilized as a recreational trail under the management of the State of Idaho and the Coeur d'Alene Tribe. Conversion of the ROW to a recreational trail allows for continued control and management of the ROW as part of the risk management strategy for the ROW. The Trail Element of Work included the installation of amenities for the recreational trail and modifications to the existing railroad bridges to make the bridges suitable for recreational trail use.

**Residential Use Area:** This element of work addressed mine waste that was found within those portions of the ROW that had a residential type of use. The detailed requirements for this element of work were specified within the Residential Use Area Work Plan, which was submitted as a deliverable under the CD SOW and approved by the Governments.

**Maintenance and Repair:** This element of work is not part of the removal action, but is a requirement of the CD and CD SOW. It provides for the long-term maintenance of the protective barriers as more fully described within the Maintenance and Repair Plan (M&R Plan), Attachment E to the CD SOW. Under the M&R element of work, recontamination of barriers that occurred as part of a high water runoff event in 2002 were assessed via sampling and analysis and repaired. New barrier material was required in select segments to remediate the erosion of some materials. Certain segments of the asphalt required removal of flood-deposited sediments and debris. Another section of the embankment failed at construction station 1120+00 due to a sustained high water event caused by the high runoff event and resulting in a sustained high pool elevation in Lake Coeur d'Alene and consequently the tailwaters of the Coeur d'Alene River. The failure was repaired in accordance with an engineered design prepared by the UPRR consultants with clean materials including riprap, rock and barrier materials, and a geosynthetic clay liner to minimize connectivity between the river and a water-control ditch on the upland side of the embankment. The repair has shown no signs of weakness or degradation in recent inspections.

Construction activities for the Wallace-Mullan Branch removal action began with rail and tie removal in July 2000 in Wallace, Idaho. The last construction activity, modifications to the Chatcolet Bridge, was substantially complete by the end of March 2004. The USEPA Region 10, the IDEQ, the IDPR, and the Coeur d'Alene Tribe provided oversight throughout the construction activities. The Governments oversight was coordinated and supported by the USACE.

The Wallace-Mullan Branch removal action represented a unique construction project that extended over 72 miles. The size and scope of the activities was considerable, including:

- Removal, decontamination, and salvage for reuse of over 46,000 tons of rail and 132,000 railroad ties;
- Removal and offsite disposal of over 175,000 cubic yards of mine-waste-contaminated materials;
- Placement of approximately 200,000 cubic yards of barrier material;
- Cleanup of over 25 residential yard areas;
- Placement of nearly 65 miles of 10-foot-wide asphalt barrier/trail and improvement of another 7 miles of existing asphalt trail through OU1 and OU2;
- Repair or replacement of over 70 culverts;
- Placement of over 13,000 tons of rock riprap;
- Repair and modification of 36 bridges, including the Chatcolet Swing Span, for recreational trail use, and installation of five new pedestrian bridges;
- Raising of the 220-foot-long Chatcolet Swing Span (which weighed over 300 tons) and reinstallation as a fixed-span bridge to facilitate continuation of the trail across Coeur d'Alene Lake and to preserve the historical integrity of the swing span portion of the bridge; and
- Installation of trail amenities including 10 trailheads, 7 oasis areas, and 11 stop-and-view areas, including associated tables, benches, compost toilets, and access controls.

### 5.8.4 Actions Since Last Five-Year Review

Since the construction began in July 2000 and was essentially completed by March 2004, the UPRR removal action has not undergone a previous five-year review. Generally, the entire scope of the removal action has been implemented since the previous Bunker Hill Mining and Metallurgical Complex five-year review (USEPA, 2000a and 2000b). The following sections describe the certification process which has been completed this year and the remaining activities.

#### 5.8.4.1 Certification

Paragraph 69 of the CD specifies that if, after a pre-certification inspection, the UPRR believes that a portion of the removal action has been fully performed and the performance standards have been attained, it shall submit a written report to the Governments requesting certification. Following the pre-certification inspections and resolution of issues identified in those inspections, the UPRR submitted Completion of Obligation Reports (CORs) for each portion of the work. Those reports have been reviewed and approved by the Governments and placed in the public document repositories and the Action was certified in early 2005. Copies of the certification letter have also been placed in the public document repositories.

#### 5.8.4.2 Remaining Activities

With completion of the removal action and following resolution of encroachment issues, the ROW will transfer to the State and the Coeur d'Alene Tribe pursuant to the CITU. The State and Tribe will share in the management of the ROW under a management agreement between the State and Tribe. The State and Tribe will also manage the trail use within the ROW and perform maintenance of the trail facilities (i.e., trash pick-up, restrooms, etc.). As part of their obligations under the CD, the UPRR has provided a lump-sum cash payment to support the trail maintenance activities by the State and the Coeur d'Alene Tribe.

Under the M&R Element of Work, the UPRR retains responsibility for maintenance and repair of protective barriers (including the asphalt barrier and trail within the Reservation), rail bed embankments that provide a foundation for the trail portion of the ROW, certain aspects of the Chatcolet Bridge, and access controls that are necessary to restrict access onto and off of the trail for purposes of managing exposure and protection of barriers. The detailed requirements for these maintenance and repair activities are specified in the M&R Plan.

Pursuant to Paragraph 18 of the CD, the UPRR may be requested to conduct future studies or investigations to enable the USEPA and the State and Tribe to conduct reviews of the protectiveness of the remedy. As the trail becomes seasoned and use patterns stabilize, the remedy can be more fully assessed and will likely warrant studies and investigations.

As part of the risk management approach for the ROW, the EE/CA contemplated an ICP for the ROW. Part of the ICP was implemented with the installation of signage, and access controls as part of the removal action construction. An additional component of the ICP will be the future management of both trail-related and non-trail-related activities that may take place within the ROW, as well as education and awareness for residents of the various communities along the ROW and visitors to the area. This portion of the ICP will be managed by the State and the Coeur d'Alene Tribe. General details of this ICP program are provided in the Trail Long-Term Oversight Program Manual (TerraGraphics, 2005c). The final details of this program are being worked out jointly by the IDEQ and the Coeur d'Alene Tribe.

The vegetated and gravel barriers are susceptible to invasive and non-invasive vegetative species as are any open land areas. Pursuant to the CD, the UPRR was obligated to perform a one-time application of invasive species treatment along the ROW. In the fall of 2003, the UPRR applied an herbicide to fulfill their obligations. Follow-up inspections revealed that the effort was not effective. In 2005, UPRR provided a cash settlement to each trail management entity to allow them to perform additional supplemental treatments and better enable the trail managers to apply an invasive species treatment and integrate it with a long-term invasive species management program. The State applied herbicides on most segments of the right-of-way outside of the Coeur d'Alene Reservation in both the spring and fall of 2005. The ROW on the reservation has received no weed treatment applications this year, but it is anticipated a long-term invasive species management program will begin in 2006 along that section of the ROW.

### 5.8.5 Institutional Controls

Institutional controls are a major component of the UPRR removal action. The completion and implementation of effective ICs, including the Trail Long-Term Oversight Program (TLOP), and State-Tribe management agreements are critical to assure the protectiveness of the barriers placed on the UPRR ROW. While the installation of the barriers was completed relatively recently and they have many years of serviceable life remaining, failure to have a properly functioning ICP and Management Plan could threaten their protectiveness. The EE/CA identified the ICs as one possible alternative and recommended they be used in conjunction with other response actions. Several ICs are currently implemented, such as health warning signs, public education, user management signs, and trail maps. Actual management of the trail incorporates ICs as managers educate users, discourage high-risk user behavior, and manage overall activities. Another component of the ICs that has not been implemented is the TLOP, which is currently being finalized by the State and the Tribe. It will assist managers and decisionmakers with issues such as neighboring development and infrastructure encroachment. The final details revolve around how the TLOP will provide the necessary protection and long-term management program on a geographically diverse remedy.

### 5.8.6 Technical Assessment of UPRR Removal Action

Per USEPA guidance (USEPA, 2001e), technical assessment of the UPRR removal action was conducted by evaluating the following three questions related to protectiveness of implemented actions:

#### *Question A: Is the remedy functioning as intended by the decision documents?*

The UPRR remedy is functioning as intended by the decision documents.

As summarized in Section 5.8.1, the removal action objectives of the UPRR removal action are to:

- Limit the direct exposure to mine waste; and
- Limit the potential for environmental transport of contaminants

The UPRR has conducted periodic and event-driven inspections on the trail. In addition, trail management personnel representing both the Coeur d'Alene Tribe and the IDPR are frequently on the trail and have been interviewed recently. The inspection reports and interviews indicate that the barriers are functioning as designed and the vegetation is thriving. Surface water ditches and culverts have been cleaned out as needed and are performing adequately. Trail managers continue to monitor trail access and use patterns. Since the trail use is in its infancy, patterns are still developing. Should unauthorized use patterns develop, management and use strategies will need to be implemented to curb and change those patterns that increase the risk of exposure to trail users.

The completion and implementation of the Institutional Controls Program, including the TLOP, and State-Tribe management agreements are critical to assure the protectiveness of the barriers placed on the UPRR ROW. Although the barriers have many years of serviceable life remaining, failure to have a properly functioning ICP and Management Plan could threaten their protectiveness. These agreements must move forward quickly.

A few small seeps have been identified along the shoreline of Lake Coeur d'Alene near O'Gara Bay. Seeps are a natural phenomenon in altered and natural environs, and are a result of hydraulic head pressure differential across a boundary and the system equilibrating that differential. In this particular case, the seeps occur during low lake pool elevations when the lake water surface elevation drops faster than the water surface elevation in some wetlands on the upland side of the rail embankment. Given the small magnitude of these seeps and the millions of tons of metals in the lake bed, it is not believed that they are a major contribution to water quality degradation, if measurable at all. The current Lake Environmental Monitoring Program and the upcoming nearshore Clean Water Act sampling will help create a more comprehensive picture of the status of water quality and environmental factors in the lower lake area. There is no compelling information to suggest that additional monitoring is warranted at this time.

#### *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?*

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection remain valid for the UPRR Removal Action.

Section 5.2 summarizes the ARARs review for the applicable OU2 decision documents. None of the new or revised standards identified in Section 5.2 are ARARs or potential ARARs for the UPRR removal action.

#### *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

This five-year review did not find any new information that calls into question the protectiveness of the UPRR removal action remedy. Upon inspection of the beach sand at Harrison Beach in December 2004, rills were detected that resulted in decreased barrier thickness. The UPRR repaired the rills under the M&R obligations. This situation warrants further monitoring.

### Remedy Issues

Table 5-67. Summary of UPRR Removal Action Issues

| Issues | Affects Protectiveness (Y/N) Current (now to 1 year) | Affects Protectiveness (Y/N) Future (>1 year) |
|---|---|---|
| **Harrison Beach Sand:** Potential erosion of barrier layer may be occurring (based on visual observation). | N | Y |
| **Use Patterns:** Potential unauthorized uses may result in increased exposure to contaminants of concern. | N | Y |

### Recommendations

Table 5-68. Summary of UPRR Removal Action Recommendations and Follow-Up Actions

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) Current (now to 1 year) | Follow-up Actions: Affects Protectiveness (Y/N) Future (>1 year) |
|---|---|---|---|---|---|
| **Harrison Beach Sand:** Continue performance monitoring. | UPRR | Coeur d'Alene Tribe, State of Idaho | 9/2010 | N | Y |
| **Unauthorized Use Patterns:** Continue monitoring. | UPRR | Coeur d'Alene Tribe, State of Idaho | 9/2010 | N | Y |
| **TLOP:** Finalize TLOP and begin implementation | Coeur d'Alene Tribe, State of Idaho | USEPA | 5/2006 | N | Y |
| **Management Agreement:** Finalize and Implement State-Tribe Management Agreement. | Coeur d'Alene Tribe, State of Idaho | USEPA | 5/2006 | N | Y |

## 5.9 Performance Evaluation of OU3 Remedy

The ROD for OU3 was issued in September 2002 and remedy implementation has been occurring for less than 3 years. This interim ROD is a 30-year cleanup plan that represents a significant step toward meeting the goal of full protection of human health and the environment in the Basin. The OU3 remedy implemented to date is generally functioning as designed. The USEPA will continue to evaluate performance of the OU3 remedy through review of BEMP results, remedial action effectiveness results, and other indicators.

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# 6 Actions, Issues, and Recommendations

## 6.1 Operable Unit 1

Table 6-1 presents a summary of the activities and remedial actions conducted in Operable Unit 1 since the last five-year review. Tables 6-2 and 6-3 summarize the issues identified during this five-year review process and recommendations and follow-up actions.

## 6.2 Operable Unit 2

Table 6-4 presents a summary of the activities and remedial actions conducted in Operable Unit 2 since the last five-year review. Tables 6-5 and 6-6 summarize the issues identified during this five-year review process and recommendations and follow-up actions.

## 6.3 Operable Unit 3

For Operable Unit 3 (OU3), both removal actions and remedial actions were reviewed for this five-year review. Table 6-7 presents a summary of the removal actions conducted in OU3 and Tables 6-8 and 6-9 summarize the issues and recommendations for these removal actions. Table 6-10 summarizes the remedial actions conducted in OU3 to-date. Table 6-11 summarizes the remedial action issues identified and 6-12 summarizes the recommendations and follow-up actions.

**Table 6-1. Summary of ROD Activities and Remedial Actions – Operable Unit 1**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Soil Remediation | Upstream Mining Group (UMG) | 1994-Present | Partially excavate contaminated soils and install clean soil barriers or other protective barriers (e.g., gravel and asphalt) on residential yards, commercial properties, and rights-of-way in OU1. Ensure proper disposal of contaminated soils in the Page Repository. From 2002-2004, the USEPA and the IDEQ took over a portion of the UMG's Consent Decree work obligations. The USEPA and the IDEQ expect UMG to fully comply with the Consent Decree (CD) requirements from 2005 forward. |
| Hillside Sloughing and Stabilization | IDEQ, USEPA | 1995-2004 | Stabilize hillside areas adjacent to residential yards that are sloughing contaminated soils into residential yards. |
| Air Monitoring | UMG, USEPA, | 1995-Present | Monitor air quality through personal monitors used by workers at yard remediations and other monitoring stations in the Box. OU1 monitoring stations were discontinued in 2003 but personal monitors are continuing to be used by workers at yard remediations. |
| House Dust Monitoring | IDEQ, USEPA | 1988-Present | Monitor house dust lead concentrations, lead loading rates, and dust loading rates through vacuum bags and dust mats as residential soil remediation is completed. |
| Interior Cleaning Pilot Project | IDEQ, USEPA | 2000 | As follow-up to the 1990 interior cleaning pilot project, completed a second pilot project to assess the long-term effectiveness and costs for a one-time interior cleaning program in a community where soil remediation has been completed (i.e., Smelterville). |
| Lead Health Intervention Program (LHIP) | PHD | 1985-present | Provide health education services to local residents, including annual blood lead screening and nurse follow-up visits for children with elevated blood lead levels to help identify and reduce exposures. |
| Institutional Controls Program (ICP) | PHD | 1995-Present | Ensure that protective barriers are maintained over time and provide services to local residents, including vacuum loan program and free disposal locations for contaminated residential soils. |

**Table 6-2. Summary of Issues - Operable Unit 1**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **Right-of-Way (ROW) Recontamination:** ROW recontamination appears to be increasing at a slow rate. | N | Y |
| **Hillside Sloughing:** Contamination from eroding hillsides adjacent to residential areas was identified as a potential source of recontamination. Most of these hillsides have been addressed, but there could still be some that need to have appropriate controls installed. | N | Y |
| **One-time Interior Cleaning:** Results of two pilot studies indicate that house dust lead concentrations return to pre-remediation levels within one year of cleaning, regardless of the cleaning method. Recent data confirm that house dust lead concentrations have achieved the community mean of 500 mg/kg and the number of homes exceeding 1,000 mg/kg lead in house dust is declining. | N | Y |
| **Institutional Controls Program (ICP):** Permanent funding of the ICP is needed to ensure success of the remedy. | N | Y |
| **Disposal/ICP Repository:** Long-term repository needs will require additional disposal capacity. | N | Y |
| **Infrastructure:** Infrastructure maintenance and improvements remain an issue. The remedy relies on functioning infrastructure to be sustainable. Resources to repair and install infrastructure have been difficult to secure by local governments. | Y | Y |

**Table 6-3. Summary of Recommendations and Follow-Up Actions – Operable Unit 1**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Right-of-Way (ROW) Recontamination:** Conduct ROW sampling and analysis to determine if lead concentrations have remained stable. | IDEQ | USEPA | 12/2009 | N | Y |
| **Hillside Sloughing:** Evaluate unaddressed hillside sloughing areas adjacent to residential yards and determine if control measures are needed. | IDEQ, USEPA | IDEQ, USEPA | 12/2006 | N | Y |
| **Mine Dumps:** Assess new information regarding erosion or access concerns for mine dumps on hillsides adjacent to residential yards. | IDEQ, USEPA | IDEQ, USEPA | 12/2006 | N | Y |
| **One-time Interior Cleaning:** Evaluate need for implementation of the interior cleaning component of the remedy. Continue monitoring house dust concentrations annually as soil remediation is completed. | IDEQ, USEPA | USEPA | 12/2006 | N | Y |
| **Lead Health Intervention Program (LHIP):** Continue offering services, including blood lead screening services and follow-up nurse visits to help identify and mitigate potential exposure pathways. | PHD | IDEQ, USEPA | 12/2009 | N | Y |
| **Institutional Controls Program (ICP):** Continue offering ICP programs, including the vacuum loan program. Secure permanent funding for the ICP as required by the 1994 Consent Decree. | PHD, Upstream Mining Group (UMG) | IDEQ, USEPA | 12/2007 | N | Y |
| **Disposal/ICP Repository:** Address long-term disposal needs as part of permanent funding for ICP, as required by the 1994 Consent Decree. Evaluate need for snow disposal area. | PHD,UMG | IDEQ, USEPA | 12/2007 | N | Y |

| Table 6-3. Summary of Recommendations and Follow-Up Actions – Operable Unit 1 | | | | | |
|---|---|---|---|---|---|
| | | | | Follow-up Actions: Affects Protectiveness (Y/N) | |
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Current (now to 1 year) | Future (>1 year) |
| **Infrastructure:** Repair and regularly maintain existing infrastructure (e.g., failing roads). | Local Governments | IDEQ, PHD, USEPA | 12/2009 | Y | Y |
| Identify funding and other resources for infrastructure maintenance and improvements to protect the remedy, such as storm water controls. | Local Governments, IDEQ, USEPA | IDEQ, PHD, USEPA | 12/2009 | Y | Y |

**Table 6-4. Summary of ROD Activities and Remedial Actions – Operable Unit 2**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Institutional Controls Program (ICP) | IDEQ | Ongoing | Same as the ICP program implemented in Operable Unit 1. |
| Health and Safety during Remediations | IDEQ , PRPs, USEPA | Ongoing | Ensure that remedial actions are implemented safely and in accordance with applicable regulations and guidance. |
| Operation and Maintenance (O&M) Plan, Operation and Maintenance | IDEQ , PRPs, USEPA | Ongoing | Ongoing monitoring, routine site inspections, and any necessary repair of completed remedial actions. Preparation of O&M Plans. |
| Hillsides | USEPA | 1990-1994 | Hillside terracing and vegetation programs by the Potentially Responsible Parties (PRPs). |
| | | 1996 | Initiation of government-led efforts for hillsides revegetation. |
| | | 2000-2005 | Revegetation of hillsides included hydroseeding, application of soil amendments, and planting of hardwood trees and shrubs. Annual evaluation and performance monitoring, maintenance as needed. Development of long-term O&M Plan and performance standards. Access controls maintained in some areas, but an issue in many areas. |
| Grouse Gulch | PRP | 1995-1997 | The Bunker Limited Partnership (BLP) removed approximately 1,200 cubic yards of tailings above the uppermost gabion structure from locations closest to the creek and disposed in the Central Impoundment Area (CIA). A new gabion dam was constructed in the lower reaches. Access roads were improved to enable access to gabion structures. The Wyoming mine dump located near the creek was buttressed at its base to minimize potential for erosion. Approximately 2,000 cubic yards of material were removed and disposed of at the CIA. |
| | | 1997-2005 | Remedial action has not required maintenance since its completion in 1997. Shoshone County is responsible for cleaning out Grouse Gulch sediment basins to help control flooding associated with Grouse Creek in Smelterville. |
| Government Gulch | USEPA | 1996-1998 | Demolition of industrial complex structures and stacks (e.g., Lead Smelter, Zinc Plant, and Phosphoric Acid Plant). Consolidation of debris in Smelter Closure. |
| | | 2000-2005 | Reconstruction of lower portion of Government Creek. Enyeart Lumber Yard capped, as well as other discrete areas in lower Government Gulch. Maintenance and rebuilding of 800 lf of upper creek channel. Recapping of disturbed areas planned for 2006. Riparian corridor planting. No further maintenance has been required. |

**Table 6-4. Summary of ROD Activities and Remedial Actions – Operable Unit 2**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Upper Magnet Gulch | USEPA | 1995-1999 | Source removal action, reconstruction of creek channel, revegetation. |
| | | 2000-2005 | No maintenance has been required since completion of remedial action in 1999. |
| Deadwood Gulch | USEPA | 1995-1998 | Source removal action, stabilize and reconstruct creek channel, revegetation. |
| | | 2001 | Riparian corridor planting of the Deadwood Creek conducted in 2001. |
| | | 2000-2005 | No maintenance has been required since completion of majority of remedial action in 1998. |
| Railroad Gulch | USEPA | 1997 | Reconstruction of creek channel and capping. |
| | | 2000-2005 | No maintenance has been required since completion of the remedial action in 1997. |
| Smelterville Flats – North of I-90 | USEPA | 1996-1998 | *Source removal action, capping, revegetation, and stream bank stabilization.* |
| | | 2000-2004 | Riparian plantings of trees and shrubs. Noxious weed control programs conducted periodically from 2001 through 2005 by the USACE. S&P Truck Stop area capped by the PRPs in 2001; was re-remediated by the USACE later in 2001. City/Gun range road east of the S&P Truck Stop capped in 2004. |
| Smelterville Flats – South of I-90 | USEPA | 1997-1998 | Source removal action, re-grading, capping, and surface water management. |
| | | 2001 | Improvements to surface water runoff control implemented in 2001, consisting of a vegetated swale and storm drain pipe. Recapped North Idaho Recycle Yard. |
| | | 2000-2005 | No maintenance has been required since completion of the remedial action. |
| Central Impoundment Area (CIA) | USEPA | 1995-2000 | Consolidation of Mine Operations Area (MOA) demolition debris and contaminated material from various source removal actions, geomembrane cover system, surface water drainage systems, capping CIA side slopes, revegetation. |
| | | 2000-2005 | Installed perimeter fencing to limit access to the CIA, final-graded access roads, and de-mobilized construction contractor in November 2000. Annual inspections and O&M ongoing. |

**Table 6-4. Summary of ROD Activities and Remedial Actions – Operable Unit 2**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Page Pond | PRP (UMG) | 1997-2000 | Removal of West Beach tailings. |
| | | 2000 | Tailings removal, capping, revegetation, surface water controls. Limited monitoring and O&M activities ongoing, but no additional remedial actions in Page Pond since 2000. |
| Industrial Complex: Smelter Closure Area and Principal Threat Materials (PTM) Cell | USEPA | 1995-1998 | Demolition of smelter structures, demolition and haul off Zinc Plant debris to smelter closure area, infilling demolition debris with slag, consolidation of source removal material at closure area, construction of PTM cell, placement of PTMs and closure of cell, geomembrane cover system, surface water management, revegetation, perimeter fencing. |
| | | 2004-2005 | Remedial action was complete in 1998. In 2004, a gravity collection and conveyance system for drain water was designed to replace a pumped system. System was constructed in 2005. Ongoing monitoring of well system for smelter closure observational approach. Minor routine O&M. |
| Industrial Complex: Borrow Area Landfill | IDEQ, USEPA | 1997-1998 | Borrow Area constructed to provide clean fill for site remediations. |
| | | 2000-2001 | Received waste from lower industrial landfill and other miscellaneous site waste below PTM action level. |
| | | 2002-2005 | Landfill closed; grading, surface water management, soil cover, revegetation, and settlement monitoring points. |
| | | | No maintenance has been required since closure of Borrow Area. |
| Industrial Complex: Area 14 | USEPA | 1997-1999 | Two sedimentation ponds (Gilges Pond and Sweeney Pond) were excavated and backfilled. |
| | | 2005 | Phased remedial design and remedial action to be initiated in 2006. |
| Mine Operations and Boulevard Areas | USEPA | 1995 | MOA: Demolition of structures, source removal actions, site grading, capping, and revegetation. |
| | | 1997 | Boulevard: Source removal action, replacement with clean soil, re-grading, surface waste management, revegetation. |
| | | 2000-2005 | No further remedial work has been conducted. No maintenance has been required since completion of these remedial actions. |

| Table 6-4. Summary of ROD Activities and Remedial Actions – Operable Unit 2 | | | |
|---|---|---|---|
| **Activity or Remedial Action** | **Responsible Entity** | **Dates** | **Description of Activity or Remedial Action** |
| Central Treatment Plant (CTP) | USEPA | 1994-1995 | Construction of CTP pond adjacent to McKinley Avenue. |
| | | 1996-1997 | Studies to prioritize maintenance needs and to optimize operation of CTP. |
| | | 1997 | Miscellaneous O&M, construction of direct discharge line from mine to CTP, ICP capping on CTP property. |
| | | 2001-Present | In 2001-2002, new direct feed mine water pipeline constructed from the Kellogg Portal to the CTP aeration basin. Emergency repairs and upgrades to the CTP and lined pond completed. |
| Bunker Creek | USEPA | 1997 | Source removal, reconstruction of creek channel, revegetation, and culverts for road crossings. |
| | | 2001-2002 | Riparian plantings along the creek corridor, ICP capping in area west of CIA closure, and construction of emergency overflow. Fence was installed between the Creek and the Union Pacific Railroad (UPRR) ROW/Trail in 2002. |
| | | | No maintenance has been required since completion of remedial action. The USEPA and the Department Idaho Fish and Game (IDFG) to address beaver dam, and monitor impact on remedy. |
| Union Pacific Railroad Right-of-Way (UPRR ROW) | PRP (UPRR) | 1995-2000 | Source removals, re-use of decontaminated materials, capping with clean barriers in accordance with 1995 Consent Decree. |
| (excluding OU3 Trail of the Coeur d'Alenes) | | 2000-Present | Remediation of the portions of the UPRR ROW adjacent to the CIA haul road and verification sampling (2000). Certification of the UPRR remedial action and incorporation of the ROW into the ICP (2001). Remaining pieces of government response areas remediated and old fuel bulk plant on the UPRR ROW in Kellogg removed and remediated (2002-2004). Portions of the UPRR ROW paved with an asphalt path. In 2005, the USACE remediated several discrete areas: one area east of Ross Ranch, and one haul road shoulders south of TCI building. The USACE will also remediate several bare patches along trail and fence line in late 2005 or early spring 2006.Inspection/monitoring and O&M activities ongoing. |

**Table 6-4. Summary of ROD Activities and Remedial Actions – Operable Unit 2**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Milo Gulch and Reed Landing | IDEQ USEPA | 1995-2000 | Milo Creek: source removal, water diversion dam and pipeline on the main stem of Milo Creek. Remedial action of lower Milo Gulch essentially complete in 2000.<br>Reed Landing: Re-grading to stable slope, disposal at Guy Caves, construction of reinforced concrete emergency overflow channel. |
| | | 2005-Ongoing | Upper Milo basin requires additional remediation (pending) per the 2001 OU2 Record of Decision (ROD) Amendment. The USEPA currently conducting remedial design of West Fork Diversion. Routine maintenance ongoing. |
| A-4 Gypsum Pond | PRP (SMC) | 1996-2000 | Construction of run-on ditches along up-gradient perimeter, removal of upper portion of existing north perimeter embankment and re-graded the downstream face of the embankment, rerouted Magnet Creek over the A-4 Gypsum Pond and then excavated and lowered Magnet Gulch channel down to the native soils at the floor of the tailings pond, construction of lined drainage channel and outfall works around the pond near eastern perimeter to convey drainage from Deadwood Gulch to Bunker Creek, installed seepage barrier along north perimeter of McKinley Pond and a new sealed culvert under McKinley Avenue from McKinley Pond. |
| | | 2001-Present | Installation of a French drain along the toe of the north dike. Completed construction of a primary drainage channel and associated outfall works at the extreme west side of the A-4 closure area to convey perennial and seasonal flows that originate from the upper reaches of Magnet Gulch, infilled existing solution cavities, plugging and partial removal of the former decant piping and re-grading of the impounded gypsum, construction of runoff control ditches near the down-gradient perimeter of the closure area to intercept and divert localized drainage to either Magnet Gulch or Deadwood Gulch channels, cover soil was placed on the A-4 complex at numerous times following remediation work and in 2002 soil was applied to the west end of the A-4 in association with the completion of the Magnet Gulch channel, in 2003 SMC applied cover soil over 75 percent of the A-4 to replace re-contaminated cover-soil, and vegetation was established on site following soil placement in 1996. The goal at that time was to minimize water infiltration into the soil cap by increasing evapotranspiration. However, the vegetation in much of the area was eliminated when the cover soil was replaced again in 2003. Final seeding completed in 2005. Final vegetative performance will be a function of O&M and the responsibility of the Stauffer Management Company (SMC). |
| South Fork Coeur d'Alene River Removal and Stabilization Project | IDEQ , USEPA | 2000-2004 | Removal and stabilization project: contaminated floodplain sediments excavated and hauled for disposal, eastern and western halves of the river reach reconstructed and revegetated, and upland areas reseeded. |

**Table 6-4. Summary of ROD Activities and Remedial Actions – Operable Unit 2**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Miscellaneous Box Projects | IDEQ, USEPA | 1998-Present | Variety of miscellaneous projects in support of larger remedial actions in OU2 including City of Smelterville fencing and road and shoulder paving, remediation of Airport road shoulders and area residences, clean water supply to users of Hangaard Arena, McKinley Avenue capping, remediation of Pinehurst Golf Course parking lot, surrounding areas of Kellogg Project office, east Smelterville private properties, residential properties and ROWs adjacent to UMG-responsible properties, and a number of access controls in the Box. |
| OU2 Water Quality Monitoring | IDEQ, USEPA | 1996-Present | Groundwater and surface water monitoring at several locations throughout OU2 to provide water quality data during remedial action implementation and provide data for post-implementation Phase I remedial action effectiveness. |

| Table 6-5. Summary of Issues - Operable Unit 2 | | |
|---|---|---|
| | Affects Protectiveness (Y/N) | |
| Issues | Current (now to 1 year) | Future (>1 year) |
| **OU2 Institutional Controls Program (ICP)** | | |
| **Funding:** Permanent funding of the ICP is needed to ensure success of the remedy. At this time, permanent funding for the OU2 ICP has not been secured. | N | Y |
| **Disposal/ICP Repository:** Long-term repository needs will require additional disposal capacity. | N | Y |
| **ICP Database:** Type and depth of barrier and contamination left behind for OU2 areas needs to be incorporated into ICP database to support long-term ICP management. | N | Y |
| **Hillsides** | | |
| **Hillsides Access Control:** Use of the hillsides by unsanctioned off-road vehicles may result in a potential human health risk from residual contamination and is producing wheel ruts that could lead to detrimental erosion. | N | Y |
| **Gulches** | | |
| **Biological Monitoring:** Elevated metals concentrations were observed in Deadwood, Government and Magnet Gulches during biomonitoring. | N | Y |
| **Smelterville Flats** | | |
| **Biological Monitoring:** Elevated metals concentrations were observed in North of I-90 areas during biomonitoring. | N | Y |
| **Central Impoundment Area (CIA)** | | |
| **State Superfund Contract (SSC) for 2001 OU2 ROD Amendment**: Lack of a SSC amendment prevents full implementation of the 2001 OU2 ROD Amendment, including installation of a new lined sludge pond on the CIA *(if required), and collection and treatment of groundwater north of the CIA* . | Y | Y |
| **Page Pond** | | |
| **North Channel:** The North Channel revegetated area has not survived the initial hydroseeding and tailings are exposed. This channel is near the Trail of the Coeur d'Alenes and the South Fork Sewer District's lift station. | Y | Y |

| Table 6-5. Summary of Issues - Operable Unit 2 | | |
|---|---|---|
| Issues | Affects Protectiveness (Y/N) | |
| | Current (now to 1 year) | Future (>1 year) |
| **Remedial Effectiveness Monitoring Program:** Possible issues in the existing Page Pond monitoring program, which were noted in the first five-year review, have not been further analyzed. | N | Y |
| **Repository Vehicle Decontamination:** Additional vehicle decontamination procedures have not been implemented at the repository. | Y | Y |
| **Biological Monitoring:** Mitigative measures should be considered for wetland loss at West Page Swamp due to expansion of Page Repository. | N | Y |
| **Remedy Implementation:** The remedy has not been fully implemented and no remedial actions have been conducted since 2000. | Y | Y |
| **Industrial Complex** | | |
| **State Superfund Contract (SSC) for 2001 OU2 ROD Amendment:** Lack of a SSC amendment between the USEPA and the State of Idaho prevents full implementation of the 2001 OU2 ROD Amendment that would upgrade the CTP where Smelter Closure flows are treated. | Y | Y |
| **Central Treatment Plant (CTP)** | | |
| **State Superfund Contract (SSC) for 2001 OU2 ROD Amendment:** Lack of a SSC amendment prevents full implementation of the 2001 OU2 ROD Amendment, including control of AMD into the CTP, additional CTP upgrades, and placing a new lined sludge pond on the CIA . | Y | Y |
| **AMD Discharge from Reed and Russel:** Control of AMD discharge at the Reed and Russel adits. | Y | Y |
| **Bunker Creek** | | |
| **State Superfund Contract (SSC) for 2001 OU2 ROD Amendment:** Lack of a SSC amendment between the USEPA and the State of Idaho prevents full implementation of the 2001 OU2 ROD Amendment. Until the full 2001 OU2 ROD Amendment is implemented, cleanup of contaminated sediments in the Bunker Creek channel caused from mine and tributary flows and minor CTP upsets is not feasible. | Y | Y |
| **Ambient Water Quality Standards (AWQC):** Bunker Creek base flows do not currently meet AWQC. | N | Y |
| **Beaver Dam**: Presence of the beaver dam may impact channel stability, flow paths, and infiltration. | N | Y |

| Table 6-5. Summary of Issues - Operable Unit 2 | | |
|---|---|---|
| | Affects Protectiveness (Y/N) | |
| Issues | Current (now to 1 year) | Future (>1 year) |
| **Union Pacific Railroad Right-of-Way (UPRR ROW)** | | |
| **Barrier Erosion:** Motor vehicle access on gravel portions of the UPRR ROW results in erosion of barrier layers. | N | Y |
| **Milo Gulch** | | |
| **State Superfund Contract for 2001 OU2 ROD Amendment:** Lack of a SSC amendment between the USEPA and the State of Idaho prevents full implementation of the 2001 OU2 ROD Amendment, including surface water mitigation work identified for Milo Creek. | Y | Y |
| **Reed Landing Adit Flows:** Near Reed Landing, adit drainage flows into an old surface water channel and into the buried 4'x4' culvert, and eventually daylights onto a soil slope. Slope instability or erosion may occur as a result of this flow. | N | Y |
| **System Requirements:** System requires periodic maintenance to control function. | N | Y |
| **OU2 Biological Monitoring** | | |
| **Wildlife Tissue Concentrations:** Wildlife tissue metal concentrations appear to continue to be elevated in post remediated areas. | N | Y |
| **Potential Wetland Loss:** Mitigative measures should be considered for wetland loss at West Page Swamp due to expansion of Page Repository. | N | Y |
| **Vegetation:** Vegetation supportive of local bird population needs additional time to recover. | N | Y |
| **Gulch Monitoring:** Further examination and monitoring at Government, Magnet, and Deadwood Gulches is required to evaluate whether post-remediation soil lead concentrations are above levels toxic to songbirds and to determine trends in songbird lead body burdens. | N | Y |
| **Sediment Lead Levels:** Sediment lead levels within the Page Pond area appear to continue to be above toxic threshold levels to waterfowl. | N | Y |
| **Small Mammals:** Metal concentration levels in OU2 small mammals continue to be elevated above reference samples and are indicative of elevated exposure. | N | Y |
| **Soil Sampling:** Soil samples have not been routinely collected in post-remediated areas. | N | Y |

**Table 6-6. Summary of Recommendations and Follow-Up Actions – Operable Unit 2**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) Current (now to 1 year) | Future (>1 year) |
|---|---|---|---|---|---|
| **OU2 Institutional Controls Program (ICP)** | | | | | |
| **Funding:** Create irrevocable trust to provide consistent cash flow for ICP operation into perpetuity. | IDEQ | IDEQ, USEPA | 12/2009 | N | Y |
| **Disposal/ICP Repository:** Establish long-term disposal plan for ICP-generated wastes. | IDEQ, PHD, USEPA | USEPA | 12/2006 | N | Y |
| **ICP Database:** Collect information for ICP property database. | IDEQ, PHD, USEPA | IDEQ | 12/2007 | N | Y |
| **Barrier Maintenance:** Identify funding and other resources for infrastructure maintenance and improvements to protect the remedy, such as storm water controls. | Local Governments, IDEQ, USEPA | USEPA | 6/2009 | N | Y |
| **Hillsides** | | | | | |
| **Hillsides Access Controls:** Assess the need for additional access control to hillsides and gulches. Inform the public of the adverse impacts resulting from off-road use. | IDEQ ,USEPA | IDEQ, USEPA | 9/2006 | N | Y |
| **Gulches** | | | | | |
| **Biological Monitoring:** Conduct additional soil sampling for metals concentrations in areas where biomonitoring is occurring. | USFWS | USEPA | 10/2006 | N | Y |
| **Gulch Phase I Remedial Action Effectiveness Monitoring:** Complete evaluation of the Phase I remedial action effectiveness monitoring data and revise the remedial action effectiveness monitoring plan as appropriate. | IDEQ,USEPA | IDEQ, USEPA | 7/2006 | N | Y |
| **Smelterville Flats** | | | | | |
| **Biological Monitoring:** Conduct additional soil sampling for metals concentrations in north of I-90 areas where biomonitoring is occurring. | USFWS | USEPA | 10/2006 | N | Y |

| Table 6-6. Summary of Recommendations and Follow-Up Actions – Operable Unit 2 | | | | | |
|---|---|---|---|---|---|
| | | | | Follow-up Actions: Affects Protectiveness (Y/N) | |
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Current (now to 1 year) | Future (>1 year) |
| **Smelterville Flats Phase I Remedial Action Effectiveness Monitoring:** Complete evaluation of the Phase I remedial action effectiveness monitoring data and revise the remedial action effectiveness monitoring plan as appropriate. | IDEQ, USEPA | IDEQ, USEPA | 7/2006 | N | Y |
| **Central Impoundment Area (CIA)** | | | | | |
| **State Superfund Contract (SSC) for 2001 OU2 ROD Amendment:** Continue, with the assistance of the State of Idaho, to pursue viable solutions to the SSC impasse. Once a solution is achieved, continue with implementation of the 2001 OU2 ROD Amendment. | IDEQ, USEPA | USEPA | 12/2007 | Y | Y |
| **CIA Phase I Remedial Action Effectiveness Monitoring:** Complete evaluation of the Phase I remedial action effectiveness monitoring data and revise the remedial action effectiveness monitoring plan as appropriate. | IDEQ, USEPA | IDEQ, USEPA, | 7/2006 | N | Y |
| **Page Pond** | | | | | |
| **North Channel:** Evaluate area that did not survive initial hydroseeding. Take action to re-establish vegetation and/or place a soil barrier over exposed tailings. Ensure access is limited to trail users, if appropriate. | UMG | IDEQ, USEPA | 4/2006 | Y | Y |
| **Remedial Effectiveness Monitoring Program:** Evaluate possible issues in existing Page Pond monitoring program. Review recommendations in 1999 monitoring program memorandum (CH2M HILL, 1999). Finalize monitoring program elements. | IDEQ, UMG, USEPA | IDEQ, USEPA | 4/2006 | N | Y |
| **Repository Vehicle Decontamination:** Evaluate appropriate decontamination improvements and put measures in place to reduce the potential for recontamination. | IDEQ, PHD, UMG | IDEQ, PHD, USEPA | 4/2006 | Y | Y |
| **Biological Monitoring:** Evaluate biological monitoring results and impacts related to Page Repository expansion. | IDEQ, UMG, USEPA | IDEQ, USEPA | 4/2006 | N | Y |
| **Remedy Implementation:** Complete Page Pond remedial actions. | UMG | IDEQ, USEPA | 12/2006 | Y | Y |

| Table 6-6. Summary of Recommendations and Follow-Up Actions – Operable Unit 2 | | | | | |
|---|---|---|---|---|---|
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Industrial Complex** | | | | | |
| **Area 14 Remediation**: Initiate phased site characterization, remedial design and remedial action at Area 14. | USEPA | USEPA | 3/2006 | N | Y |
| **State Superfund Contract (SSC) for 2001 OU2 ROD Amendment:** Continue, with the assistance of the State of Idaho, to pursue viable solutions to the SSC impasse. Once a solution is achieved, continue with implementation of the 2001 OU2 ROD Amendment. | IDEQ, USEPA | USEPA | 12/2007 | Y | Y |
| **Central Treatment Plant (CTP)** | | | | | |
| **State Superfund Contract (SSC) for 2001 OU2 ROD Amendment:** Continue, with the assistance of the State of Idaho, to pursue viable solutions to the SSC impasse. Once a solution is achieved, continue with implementation of the 2001 OU2 ROD Amendment. | IDEQ, USEPA | IDEQ, USEPA | 12/2007 | Y | Y |
| **AMD Discharge from Reed and Russel:** Work with mine owner to address AMD conveyance issues resulting in discharge of AMD at these locations. | USEPA | USEPA | 12/2007 | Y | Y |
| **Bunker Creek** | | | | | |
| **State Superfund Contract (SSC) for 2001 OU2 ROD Amendment:** Continue, with the assistance of the State of Idaho, to pursue viable solutions to the SSC impasse. Once a solution is achieved, continue with implementation of the 2001 OU2 ROD Amendment. | IDEQ , USEPA | USEPA | 12/2007 | Y | Y |
| **Bunker Creek Phase I Remedial Action Effectiveness Monitoring:** Complete evaluation of the Phase I remedial action effectiveness monitoring data and revise the remedial action effectiveness monitoring plan as appropriate. | IDEQ, USEPA | IDEQ, USEPA | 7/2006 | N | Y |
| **Beaver Dam:** Coordinate with Idaho Department of Fish & Game (IDFG) on appropriate measures to address beaver presence. | IDEQ ,USEPA | IDEQ, USEPA | 12/2005 | N | Y |

| Table 6-6. Summary of Recommendations and Follow-Up Actions – Operable Unit 2 | | | | | |
|---|---|---|---|---|---|
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Union Pacific Railroad Right-of-Way (UPRR ROW)** | | | | | |
| **Barrier Erosion:** Continue oversight monitoring of UPRR's operation and maintenance (O&M) program. | IDEQ, PHD | IDEQ, PHD | 9/2010 | N | Y |
| **Milo Gulch** | | | | | |
| **State Superfund Contract (SSC) for 2001 OU2 ROD Amendment:** Continue, with the assistance of the State of Idaho, to pursue viable solutions to the SSC impasse. Once a solution is achieved, continue with implementation of the 2001 OU2 ROD Amendment. | IDEQ, USEPA | USEPA | 12/2007 | Y | Y |
| **Reed Landing Adit Flows:** Continue discussions/negotiations with the mine owner to redirect the adit flows in the Milo drainage to the CTP for treatment. | USEPA | USEPA | 12/2005 | N | Y |
| **Permanent Access:** Secure permanent access for system maintenance. | IDEQ, USEPA | USEPA | 90/2010 | N | Y |
| **A-4 Gypsum Pond** | | | | | |
| **Vegetative Standard:** Review performance of vegetative standard at the next five-year review. It is currently estimated that this standard will be met in 2008 or 2009. | SMC | IDEQ, USEPA | 9/2010 | N | Y |
| **South Fork Coeur d'Alene River Removal and Stabilization Project** | IDEQ | USEPA | Ongoing | N | Y |
| **Observational Monitoring:** Continue informal observational monitoring of SFCDA River removal and stabilization project sites, especially after flood events. Will also include as part of Smelterville Flats Phase I Remedial Effectiveness Monitoring. | | | | | |
| **OU2 Phase I Water Quality Monitoring** | | | | | |
| **Environmental Monitoring:** Complete revision of OU2 Environmental Monitoring Plan and implement | IDEQ , USEPA | USEPA | 3/2006 | N | Y |

**Table 6-6. Summary of Recommendations and Follow-Up Actions – Operable Unit 2**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) Current (now to 1 year) | Future (>1 year) |
|---|---|---|---|---|---|
| **Conceptual Site Model:** Complete revised OU2 Conceptual Site Model | IDEQ, USEPA, | USEPA | 12/2006 | N | N |
| **Trend Analysis:** Complete statistical trend analysis of OU2 Phase I water quality monitoring data. | IDEQ, USEPA | USEPA | 12/2006 | N | Y |
| **Phase I Assessment:** Complete assessment of OU2 Phase I remedial actions with respect to water quality. | IDEQ, USEPA | USEPA | 7/2007 | N | Y |
| **OU2 Biological Monitoring** | | | | | |
| **Potential Wetland Loss:** Mitigative measures should be considered for wetland loss at West Page Swamp due to expansion of Page Repository. | UMG, USEPA | IDEQ, PHD, USEPA | 12/2006 | N | Y |
| **Environmental Monitoring Plan:** Incorporate biological monitoring components into revised OU2 Environmental Monitoring Plan. The following previously established activities are recommended for continued biomonitoring within OU2:<br>• Waterfowl blood collection<br>• Songbird blood collection<br>• Small mammal metals evaluation<br>• Fish metals evaluation<br>• Aquatic invertebrate collection<br>• Breeding Bird Surveys<br>• Monitoring Avian Productivity and Survivorship (MAPS)<br>• Page/Swamp Waterfowl Surveys<br>• Page Pond wetland vegetation mapping<br>In addition, the following activities are recommended to be included in future biomonitoring within OU2:<br>• Songbird histopathology<br>• Surface soil/sediment sampling<br>• Terrestrial invertebrate collection and/or invertebrate soil toxicity testing<br>• Amphibian population monitoring | USEPA | USEPA | 9/2005 | N | Y |

**Table 6-7. Summary of Removal Actions – Operable Unit 3**

| Site Name | Responsible Entity | Dates of Action | Description of Action |
|---|---|---|---|
| **Residential and Common-use Areas** | | | |
| Residential Yards | IDEQ ,USEPA | 1997-2002 | Partially removed lead-contaminated soils and replaced with clean soil barrier and or other protective barriers (e.g., clean gravel). From 1997-2002, actions were completed at 119 residential yards. |
| Schools/Daycares | USEPA | 1997-2001 | Partially removed lead-contaminated soils and replaced with clean soil or other protective barriers (e.g., clean gravel). Actions were completed at 7 schools and daycares. The Silver Hills Middle School was started in 1997 and additional work was completed in 1998, 2001, and 2002 due to the extremely large property size. |
| Private Drinking Water | USEPA | 1997-2002 | Provided alternate water supply to 28 residences on contaminated private wells. Alternate supplies included bottled water for11 homes, end-of-tap water treatment (water filters) for 5 homes, and municipal water hookup for 12 homes. |
| **Canyon Creek** | | | |
| Standard Mammoth Facility | ASARCO | 1997-1998 | Removal of tailings with disposal at Woodland Park Repository. Re-graded, stabilized, capped, and revegetated waste rock pile. Removed railroad grade and crossing. |
| Canyon Creek from Tamarack to below Gem | SVNRT | 1997-1998 | Time-critical removal of ~127,000 cubic yards (cy) of tailings and contaminated sediment with disposal at the Woodland Park Repository. Soils at removal areas were amended with organic materials, and then revegetated. The stream channel of Canyon Creek was stabilized with bioengineering techniques. |
| Lower Canyon Creek Floodplain | SVNRT | 1997-1998 | Time-critical removal of 472,000 cy of tailings and contaminated materials with disposal at the Woodland Park Repository. Soils at removal areas were amended with organic materials, and then revegetated. The stream channel of Canyon Creek was stabilized with bioengineering techniques. |
| Woodland Park Repository | SVNRT | 1997-1998 | Construction of an unlined repository for disposal/consolidation of removals along Canyon Creek. Repository contains approximately 600,000 cy of contaminated materials. Repository capped with native soils and revegetated. |
| Gem Portal Pilot | BLM , SVNRT, USEPA | 2000-Present | Pilot system created by Asarco (10 gallons per minute) for treatment of drainage from the Gem Portal. Continue to Evaluate Gem Portal Pilot Water Treatment System in context of Canyon Creek Water Treatment Work. |

**Table 6-7. Summary of Removal Actions – Operable Unit 3**

| Site Name | Responsible Entity | Dates of Action | Description of Action |
|---|---|---|---|
| **Ninemile Creek** | | | |
| Interstate Tailings Removal | Hecla | 1992-1993 | Removal of tailings adjacent to East Fork Ninemile Creek (EFNMC) with consolidation to a nearby uphill area. Installation of straw bales along perimeter of tailings for erosion control. |
| Interstate Mill Site | IDEQ ,SVNRT , | 1998 | Non time-critical removal of ~60,000 cy of tailings, mill debris, and contaminated sediments from the mill site and from EFNMC for 1,000 feet downstream. Disposal at an onsite repository. EFNMC stabilized with bioengineering structures in removal areas. |
| Success Mine/Mill Tailings and Waste Rock | Hecla | 1993 | Time-critical removal action included relocation and riprap armoring for ~1,600 feet of EFNMC channel; relocation of streamside tailings; placement of in-stream structures for energy dissipation; capping of tailings pile with 1-foot-thick overburden rock; installation of up gradient groundwater and surface water diversions. |
| Success Mine Site Passive Treatment | IDEQ, SVNRT USEPA , | 2000-Present | Contaminated groundwater diverted by a subsurface grout wall (approximately 1,350 feet in length) to a treatment vault. Groundwater treated using apatite. |
| East Fork Ninemile Creek Floodplain | IDEQ, SVNRT | 1994 | Time-critical removal of ~50,000 cy of flood plain tailings and contaminated sediments with disposal at the Day Rock Repository. Stream reconstruction, riparian stabilization, and revegetation. |
| Ninemile Creek Floodplain near Blackcloud | Hecla, IDEQ, | 1994 | Time-critical removal of ~44,000 cy of flood plain tailings and contaminated sediments with disposal at the Day Rock Repository. Stream reconstruction, riparian stabilization, and revegetation. |
| Day Rock Repository | Hecla, IDEQ, SVNRT | 1994 | Approximately 94,000 cy of materials from the floodplain removals were placed on top of the existing Day Rock repository and capped with native soils and growth media. |
| **Pine Creek** | | | |
| Constitution Mine and Mill Site | BLM | 1998-Present | Non-time-critical removal included removal of contaminated soils around the mill with disposal at the Central Impoundment Area (CIA), and realignment of East Fork Pine Creek away from the toe of the tailings pile. Most of the tailings and waste rock dump are on private land and have not been addressed to date. In 2002 at the Upper Constitution Site, the BLM installed a pilot mine water treatment bioreactor unit and a groundwater drain above the upper tailings pile. In 2003, the BLM made modification to the system and installed a ground water drain above the bioreactor. |

**Table 6-7. Summary of Removal Actions – Operable Unit 3**

| Site Name | Responsible Entity | Dates of Action | Description of Action |
|---|---|---|---|
| Denver Creek (includes Little Pittsburg, Hilarity, Denver and Mascot Mine) | BLM | 1996-2000 | Time-critical removal of ~5,200 cy of tailings and contaminated soils associated with the Little Pittsburg Mill. No actions have been conducted on the private portion of the pile. The mouth of Denver Creek has been undergoing stabilization and revegetation by the BLM. Re-grading at the Mascot mine was done by the mine owner, Mascot Mining, in 2002. |
| Douglas Mine and Mill Site | USEPA | 1996-1997 | Time-critical removal of two existing tailings impoundments from the flood plain of East Fork Pine Creek. 25,000 cy of contaminated materials were removed and placed into a temporary repository constructed east of Pine Creek Rd. near the mine. |
| Highland Creek Floodplain | BLM | 1999 | Time-critical removal of 8,100 cy major discrete tailings deposits along Highland Creek on public lands. |
| Highland-Surprise Mine/Mill Site (Includes Nevada Stewart Mine) | BLM | 1999 | Diversion of Highland Creek to reduce erosion of the lower waste rock dump. Most of the facilities at this site are on private land, thus no other actions have been taken to date. In 2001 and 2002, the BLM re-graded the upper and lower rock dumps at Highland Surprise. Along with that effort in 2002 the BLM also re-graded the Nevada Stewart rock dump. |
| Sidney (Red Cloud) Mine/Mill Site | BLM | 1997-Present | Non-time-critical removal of contaminated soils around the mill foundations with disposal at the CIA; run-on and run-off controls; and improvements to the upstream culvert on Red Cloud Creek to control flow through the site and reduce downstream erosion. Passive treatment of adit drainage with inflow prevention at the Sidney Shaft in Denver Creek. Rock dump re-graded and hydroseeded in 2000 to minimize erosion. Additional stream channel work at the toe of the dump was performed in 2002. In 2001, the BLM started pilot water treatment efforts with the Sidney Red Cloud tunnel mine discharge. In 2003, a pilot bioreactor water treatment system was installed and is continuing to be operated and monitored. |
| Amy-Matchless Mill Site | BLM | 1996-2000 | Time-critical removal of ~9,600 cy of tailings and contaminated soils in 1996 and 1997. In 1998, a non-time-critical removal action removed an additional 420 cy of residual tailings. Disturbed area covered with soil and revegetated. Mine adit was closed by backfilling. Waste rock dump re-graded and revegetated. |
| Liberal King Mine/Mill Site | BLM | 1996-2000 | Time-critical removal of ~9,400 cy of tailings and contaminated soils. In 1998, 99 cy of mill site tailings and mill wastes were removed from the mill area. In 1999, non time-critical removal of an additional 1,800 cy of tailings, re-grading backfill of a dry adit, import of growth medium, and revegetation. The 2000 actions included extensive grading and planting of riparian vegetation. There are continuing efforts to further revegetate and stabilize the stream reach with additional stream work and plantings of shrubs and trees. |

| Table 6-7. Summary of Removal Actions – Operable Unit 3 | | | |
|---|---|---|---|
| **Site Name** | **Responsible Entity** | **Dates of Action** | **Description of Action** |
| Nabob Mine/Mill Site | BLM | 1994-2000 | Soil cover over the tailings pile and a portion of mill area; fence to limit access to the mill site and tailings; channel improvements along Nabob Creek to stabilize the channel and prevent erosion of the tailings pile embankment. In 1995, the mine operator seeded and placed soil cover materials over the tailings, but success of the revegetation is limited. In 2000, the BLM started an investigation at the site drilling 20 wells around the pile and mill. Also in 2000, the BLM installed a groundwater cutoff drain above and along the side of the tailings pile. In 2001, the BLM re-graded the Nabob Mid-level rock dump. |
| **Moon Creek** | | | |
| Silver Crescent and Charles Dickens Mines | USFS | 1998-2000 | Non-time-critical removal of ~130,000 cy of tailings, waste rock, contaminated soils, and mill structures, with disposal at an onsite repository. Closure of four adits. Stream relocation and vegetative and structural rehabilitation along approximately 3,300 feet of Moon Creek, and 10 acres of riparian revegetation. . |
| Elk Creek Pond at Mouth of Moon Creek | SVNRT, USACE, USEPA | 1994; 2000 | Limited tailings removal in 1994. Clean sand was imported for a recreational beach at this swimming hole. Time-critical removal of 28,000 cy of contaminated sediments and tailings in 2000 (Liverman, 2004). |
| **Upper South Fork Coeur d'Alene River** | | | |
| Morning Mine No. 6 | Hecla | 1989; 2000 | Adit drainage directed to subsurface flow, rock-bed filter treatment system. Slaughterhouse Gulch was lined to reduce infiltration through the waste rock pile. |
| Osburn Flats | SVNRT | 1997-1998 | Removal of 133,000 cy of tailings and contaminated soil. Project also tested the application of various in situ treatments to tie up metals. |
| **Grouse Creek** | | | |
| We Like Mine | BLM | 2001-Present | The We Like Mine is in the upper part of Grouse Creek, just above the original Star Mine Rock Dump area. In 2001, the BLM started mine water investigations. In 2003, a pilot bioreactor tank water treatment system was installed and continues to operate. |
| **South Fork Coeur d'Alene River** | | | |
| South Fork Floodplain Removals | SVNRT | 1998 | Non-time-critical removals at several areas in the floodplain totaling about 128,000 cy of tailings and contaminated soils. |
| Elizabeth Park Stream Bank Stabilization | SVNRT | 1994; 1999 | The project removed 13,585 cy of tailings from the river and used the material to construct a compacted levee over 2,100 feet long on the south river bank. Additionally, 8,027 tons of riprap was placed on the riverbanks to protect them from further erosion. The project also installed in-channel stabilization, aquatic habitat features, and riparian zone enhancements. Work on the project was initiated in September 1994, and completed in May 1995. In 1999, additional river barbs were installed to enhance |

| Table 6-7. Summary of Removal Actions – Operable Unit 3 | | | |
|---|---|---|---|
| **Site Name** | **Responsible Entity** | **Dates of Action** | **Description of Action** |
| | | | aquatic life. |
| **Lower Coeur d'Alene River** | | | |
| Cataldo Mission | Coeur d'Alene Tribe | 1995 | Removal of ~700 cy of tailings and contaminated soils from traditional campground areas in the vicinity of the Cataldo Mission. |
| Cataldo Boat Ramp | IDEQ | 1996-1997 | Placement of cabled-log bank protection and brush wattling to reduce erosion, and planting of bushes in the vicinity of contaminated soils to discourage human contact with the soils. |
| Black Rock Slough Trailhead/Highway 3 Crossing | USEPA | 2001-2002 | Graded and capped access road and parking area and a trail providing access to Trail of the Coeur d'Alenes; stabilization of 125 feet of eroding river bank. |
| Killarney Lake Boat Launch | BLM | 1991-1998 | Covered contaminated shoreline with geotextile fabric overlain with 12-inch rock. Paved the floodplain area and road, covered edge areas with topsoil and sodded grass, and rebuilt concrete plank boat launch. Provided drinking well and vaulted toilets at the site. |
| Dudley Bank Stabilization | SVNRT | 1999 | Pilot bank erosion project to evaluate effectiveness of rock berms in reducing bank erosion cased by piping, or undercutting by boat wake. The project berms were constructed along 625 feet of the south bank and 720 feet of the north bank of the lower CDA River upstream of the Dudley landing. The berms were constructed with large rocks placed on a geotextile fabric to prevent fine-grained soil from being washed out and undermining the berms. The berms were about 2 feet wide and were placed from 7 to 30 feet from the top of the riverbank. Monitoring in late 2000 found that very little bank erosion had occurred and the berms have remained stable (Golder, 2001). |
| Medimont Bank Stabilization | IDEQ, Soil Conservation Service | 1994 | Placement of four types of bank erosion control: two with hay bales, two with riprap. Subsequent monitoring indicated that the hay-bale methods were not effective in this portion of the river. |
| Medimont and Rainy Hill Boat Launches | Asarco, Hecla<br>USFS | 1999 | Approximately 1,000 cy of clean aggregate capped contaminated parking and access areas, 3- to 6-inch rock placed in shallow areas to discourage children from playing in contaminated sediments, boulders placed to control traffic. |
| Thompson Lake Boat Launch | USEPA | 1999-2000 | Removal of contaminated sediments from shoreline, geotextile fabric placed against bank, and overlain with 12-inch rock. Existing unpaved parking lot rebuilt and capped with asphalt, concrete planks installed to provide boat launch. |
| Anderson Lake Boat Launch | USEPA | 1999 | Removal of contaminated sediments from shoreline, geotextile fabric placed against bank, and overlain with 12-inch rock. Existing unpaved parking lot rebuilt and capped with asphalt, concrete planks installed to provide boat launch. |

| Table 6-7. Summary of Removal Actions – Operable Unit 3 | | | |
|---|---|---|---|
| **Site Name** | **Responsible Entity** | **Dates of Action** | **Description of Action** |
| **Trail of the Coeur d'Alenes**<br>(Union Pacific Railroad [UPRR] Wallace-Mullan Branch ROW Removal Actions) | UPRR | 2000-2004 | The UPRR conducted a removal action and established a recreational trail on the UPRR ROW in OU3. See Section 5.8 of the report for more information on this removal action. |

| Table 6-8. Summary of Issues - Operable Unit 3 Removal Actions | | |
|---|---|---|
| | Affects Protectiveness (Y/N) | |
| Issues | Current (now to 1 year) | Future (>1 year) |
| **Residential Areas**: Issues for Residential Area Removal Actions are similar to Remedial Actions for Residential Areas (see Table ES-11). | | |
| **Canyon Creek** | | |
| **Gem Portal Pilot:** Need to evaluate the Gem Portal pilot project in the context of the 2002 OU3 ROD and in light of other water treatment work planned for Canyon Creek and other inputs into Canyon Creek. The Gem Portal pilot project is on BLM land and the BLM is not supportive of this location for a final, long-term treatment system. | Y | Y |
| **Lower Coeur d'Alene River** | | |
| **Recontamination at Medimont and Rainy Hill Boat Launches**: Gradual recontamination of surface soil at both sites has occurred over the past 5 years due to flooding and high spring flow. | N | Y |
| **Anderson Lake Boat Launch:** Keep abreast of Hwy 97 bridge replacement adjacent to boat launch. | N | To Be Determined pending completion of bridge replacement |
| **Trail of the Coeur d'Alenes** | | |
| **Harrison Beach Sand:** Potential erosion of barrier layer may be occurring based on visual observation. | N | Y |
| **Use Patterns:** Potential unauthorized uses may result in increased exposure to contaminants of concern. | N | Y |

Table 6-9. Summary of Recommendations and Follow-Up Actions – Operable Unit 3 Removal Actions

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Residential and Common Use Areas** | | | | | |
| Recommendations and Follow-up Actions for Residential Area Removal Actions are similar to Remedial Actions for Residential Areas (see Table ES-12). | | | | | |
| **Canyon Creek** | | | | | |
| **Standard Mammoth Facility:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ, USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Canyon Creek from Tamarack to below Gem:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ, USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Lower Canyon Creek Floodplain:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ, USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Woodland Park Repository:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. This includes collection and evaluation of groundwater monitoring data. | IDEQ, USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Gem Portal Pilot:** Continue to evaluate pilot treatment system in context of Canyon Creek remedy. | BLM, USEPA | USEPA | Ongoing | Y | Y |
| **Ninemile Creek** | | | | | |
| **Interstate Tailings Removal:** Routine monitoring | Hecla | IDEQ, USEPA | Annually | N | N |
| **Interstate Mill Site:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ, USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Success Mine/Mill Tailings and Waste Rock:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action | IDEQ, USEPA | IDEQ, USEPA | 12/2009 | N | Y |

| Table 6-9. Summary of Recommendations and Follow-Up Actions – Operable Unit 3 Removal Actions | | | | | |
|---|---|---|---|---|---|
| | | | | Follow-up Actions: Affects Protectiveness (Y/N) | |
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Current (now to 1 year) | Future (>1 year) |
| program. | | | | | |
| **Success Mine Site Passive Treatment:** Continue to monitor results of the pilot study and incorporate the information into the ongoing Canyon Creek water quality treatability studies and design work. | IDEQ, USEPA | IDEQ, USEPA | 12/2009 | N | Y |
| **East Fork Ninemile Creek Floodplain:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ, USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Ninemile Creek Floodplain near Blackcloud:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ , USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Day Rock Repository:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ, USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Pine Creek** | | | | | |
| **Constitution Mine and Mill Site:** Remedial action scheduled for summer 2006. Post RA monitoring required as follow-up. Continue to monitor and operate the pilot water treatment unit. | BLM, USEPA | BLM, USEPA | Construction Scheduled for Summer 2006 | N | N |
| **Denver Creek (Includes Little Pittsburg, Hilarity, Denver Mine, and Mascot Mine):** Tailings near the confluence with Pine Creek on private land remains and needs to be evaluated in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. Continue efforts to stabilize and revegetate mouth of Denver Creek. At the Little Pittsburg Mine, surface structures are within the active channel of Denver Creek and one adit is flooded and filled with stream sediment. Hilarity mine needs revegetation and stream work and Denver Mine has open tunnels and collapsed stopes. All previous work needs to be evaluated in context of | BLM, USEPA | BLM, USEPA | Based on ROD schedule | N | N |

| Table 6-9. Summary of Recommendations and Follow-Up Actions – Operable Unit 3 Removal Actions | | | | | |
|---|---|---|---|---|---|
| | | | | Follow-up Actions: Affects Protectiveness (Y/N) | |
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Current (now to 1 year) | Future (>1 year) |
| ROD and if warranted incorporate into remedial action program. | | | | | |
| **Douglas Mine and Mill Site:** The mine discharge, old mill foundation area and rock dump areas will be evaluated in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. Several homes have been constructed near floodplain containing tailings. This area needs to be evaluated for human exposure and exposure to grazing animals. | USEPA | BLM, USEPA | Based on ROD schedule | N | N |
| **Highland Creek Floodplain:** Ongoing revegetation and monitoring. Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | BLM | BLM, USEPA | Based on ROD schedule | N | N |
| **Highland-Surprise (Includes Nevada Stewart Mine):** High flows in Highland Creek have eroded the base of a Highland Surprise mine dump. Ongoing effort to revegetate the lower Highland Surprise rock dump. Mine adit discharge needs to be evaluated. Nevada Stewart rock dump needs further revegetation and site needs long term management of mine water discharge. Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | BLM | BLM, USEPA | Based on ROD schedule | N | N |
| **Sidney (Red Cloud):** Continue to monitor and operate the pilot water treatment unit. Evaluate waste rock pile and adit discharge in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | BLM | BLM, USEPA | Based on ROD schedule | N | N |

**Table 6-9. Summary of Recommendations and Follow-Up Actions – Operable Unit 3 Removal Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Amy-Matchless Mill Site:** Limited revegetation and stream stabilization at the Amy site. Matchless has waste rock dumps, collapsed tunnels, and discharges that need to be evaluated in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | BLM, USEPA | BLM, USEPA | Based on ROD schedule | N | N |
| **Liberal King:** Continue efforts to further revegetate and stabilize the stream reach with plantings of shrubs and trees. Evaluate mine opening, waste rock dump, and mill site foundation area in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | BLM | BLM, USEPA | Based on ROD schedule | | |
| **Nabob:** Tailings remain near the Nabob Mill that need to be addressed. The BLM is continuing the site investigation and is planning to install a cover over the tailings pile in the near future. Evaluate upper and mid rock dump, mine tunnel discharge and other actions taken in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | BLM, USEPA | BLM, USEPA | Based on ROD schedule | | |
| **Moon Creek** | | | | | |
| **Silver Crescent and Charles Dickens:** Ongoing monitoring. | USFS | IDEQ,USEPA ,USFS | Based on ROD schedule | N | N |
| **Elk Creek Pond at Mouth of Moon Creek:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ,USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Upper South Fork Coeur d'Alene River** | | | | | |
| **Morning Mine No. 6:** Routine monitoring | Hecla | IDEQ, USEPA | Annually | N | N |
| **Osburn Flats:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ,USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |

**Table 6-9. Summary of Recommendations and Follow-Up Actions – Operable Unit 3 Removal Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) | |
|---|---|---|---|---|---|
| | | | | Current (now to 1 year) | Future (>1 year) |
| **Grouse Creek** | | | | | |
| **We Like Mine and Star Rock Dump:** Continue to evaluate and monitor the pilot bioreactor water treatment system. Rock dump needs stabilization and revegetation. Star Rock dump needs to be evaluated in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | BLM, USEPA | BLM, USEPA | Based on ROD schedule | N | N |
| **South Fork Coeur d'Alene River** | | | | | |
| **South Fork Floodplain Removals:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ, USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Elizabeth Park Bank Stabilization:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ,USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Lower Coeur d'Alene River** | | | | | |
| **Cataldo Mission:** Post flood monitoring. | USEPA | Coeur d'Alene Tribe, USEPA | 9/2010 | N | N |
| **Cataldo Boat Ramp:** Incorporate into remedial action program and ongoing monitoring. | USEPA | USEPA | NA | N | Y |
| **Black Rock Slough Trailhead/Highway 3 Crossing:** Remedy is functioning as intended; continue to monitor streambank. | USEPA | USEPA | Ongoing | N | N |
| **Dudley Bank Stabilization:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | IDEQ,USEPA | IDEQ, USEPA | Based on ROD schedule | N | N |
| **Medimont Bank Stabilization:** Evaluate removal action in context of the 2002 OU3 ROD and if warranted incorporate into remedial action program. | Coeur d'Alene Tribe | Coeur d'Alene Tribe, USEPA | Based on ROD schedule | N | N |
| **Medimont Boat Launch** – Recommend that USFS consider paving existing boat launch area and | USFS | USFS | TBD Pending | N | N |

| Table 6-9. Summary of Recommendations and Follow-Up Actions – Operable Unit 3 Removal Actions | | | | | |
|---|---|---|---|---|---|
| | | | | Follow-up Actions: Affects Protectiveness (Y/N) | |
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Current (now to 1 year) | Future (>1 year) |
| establish paved picnic site near restrooms on north side of site. Continue day use only limitation. Address bank stabilization issues. Consider establishment of overnight RV parking area. | | | Funding | | |
| **Rainy Hill Boat Launch** - due to gradual recontamination from flooding and high spring flows, USFS plans to cap with asphalt. | USFS | USFS | TBD Pending Funding | N | N |
| **Anderson Lake Boat Launch:** The USEPA will continue to stay abreast of plans for Hwy 97 bridge replacement to the extent that this activity may influence the Superfund actions at the Idaho Department of Fish & Game's (IDFG's) Anderson Lake Facility. Pending completion of designs for the Highway 97 bridge replacement, the USEPA, the IDFG, and the Recreational Area Project Focus Team (PFT) will evaluate the potential need for additional cleanup work at this site. | USEPA | USEPA | Ongoing | N | N |
| **Trail of the Coeur d'Alenes** | | | | | |
| **Harrison Beach Sand:** Continue to monitor performance. | UPRR | Coeur d'Alene Tribe, State of Idaho | 9/2010 | N | Y |
| **Unauthorized Use Patterns:** Continue monitoring. | UPRR | Coeur d'Alene Tribe, State of Idaho | 9/2010 | N | Y |
| **TLOP:** Finalize TLOP and begin implementation. | Coeur d'AleneTribe, State of Idaho | EPA | 5/2006 | N | Y |
| **Management Agreement**: Finalize and Implement State-Tribe Management Agreement. | Coeur d'AleneTribe, State of Idaho | EPA | 5/2006 | N | Y |

**Table 6-10. Summary Activities and Remedial Actions – Operable Unit 3**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Institutional Controls Program (ICP) | PHD, IDEQ, USEPA | Yet to be established | The OU3 ICP has not yet been established, however, the PHD has met with local officials to begin discussions of program requirements, using the OU1 and OU2 ICP as a model. The OU3 ICP is expected to include several program components such as permitting, inspections, and the development of local construction regulations to be coordinated with local governments and other entities. |
| Health and Safety During Remediations | IDEQ, USEPA | Ongoing | Ensure that remedial actions are implemented safely and in accordance with applicable regulations and guidance. |
| Residential and Community Soil Remediations | IDEQ,USEPA | 2003-Present | Remediating lead- and arsenic-contaminated soil in residential yards, street rights-of-way, and commercial properties in Upper and Lower Basin communities. High-risk properties are prioritized for cleanup throughout OU3, and target area cleanup has been initiated in the communities of Mullan and Osburn. Also have provided alternate drinking water supplies for residences on contaminated private wells. |
| Coeur d'Alene Lake Fish Investigation | USEPA | 2002-2003 | Collaborative study to address data gap in human heath risk assessment. Resulted in IDHW and Coeur d'Alene Tribe joint issuance of fish consumption advisory in June 2003. |
| **Lower Basin Recreational Areas:** | | | |
| East of Rose Lake Boat Launch | USEPA | 2003-2004 | Created clean recreational area - capped contaminated soil in existing parking lot, re-built boat launch, stabilized bank to reduce erosion and human exposure to contaminated river bank. |
| Highway 3/Trail of the Coeur d'Alenes Crossing | USEPA | 2003-2004 | Created clean recreational area - built upon previous removal action conducted in 2000, capped contaminated soil with combination of pavement, topsoil/fabric/grass cap. |
| Informational Signage | USEPA | 1991; 1999; 2004 | Information signage was installed at nine recreational sites where implementation of effective, low maintenance remedial action would be difficult. Signs were initially installed in 1991 and updated in 1999 as part of Basin time critical removal actions. |
| Evaluation of sites | USEPA, USFWS | Ongoing | Continue to evaluate and identify additional Lower Basin recreational areas that may require cleanup. |
| Migratory Songbird Study | USEPA, USFWS | Ongoing | Conducting study provide site-specific data for incorporation into a risk analysis to determine if songbirds are at risk of lead exposure and to determine the lead concentrations in soil associated with potential adverse effects. |

**Table 6-10. Summary Activities and Remedial Actions – Operable Unit 3**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Canyon Creek Water Treatment Pilot Study | USEPA | 2004-Present | Testing for Phase I of the treatability study was completed in December 2004. Phase II is underway and consists of pilot-scale testing of selected active technologies and both bench- and pilot-scale testing of "passive" technologies that could address partial surface or groundwater treatment. |
| Agricultural to Wetland Conversions | USEPA | Ongoing | Identify potentially interested landowners. |
| Soil Amendment Study | IDEQ, USEPA, USFWS | 2001-2004 | Two-pronged collaborative study using both lab and field studies to evaluate effectiveness of phosphate-based soil amendments to reduce bioavailability and leachability of heavy metals. |
| Silver Dollar Growth Media Pilot | IDEQ | 2002-Present | Continue to Evaluate Growth Media Pilot Project (See text in Section 5.5). |
| Spokane River, Washington Recreational Areas | USEPA | 2002-Present | Design at Starr Road complete in 2005, and remedial actions will be implemented in 2006. Design for Island Complex will be completed in 2006, and the remedial action initiated in 2006. |
| Sisters Site | IDEQ, USEPA | 2004-2005 | In 2004, the USEPA initiated the remedial design for this site for implementation by the State of Idaho during the summer of 2005. Completed remediation in 2005. |
| Rex Mine and Mill | BLM, USEPA | 2002-2004 | Stabilization of waste rock dump and stream by-pass around tailings by BLM. In 2004 USEPA initiated the remedial design for this site which included collection of pre-design data. The remedial design is expected to be complete by the spring of 2006 with construction scheduled to start in the summer of 2006. Construction is scheduled to be completed by 2007. |
| Constitution Site | USEPA, BLM | 2004-2005 | In 2004 USEPA and BLM initiated the remedial design for this site for implementation of the remedial action in 2005. Construction of the remedy is scheduled to start in the fall of 2005 and be completed by 2006. |
| Golconda Site | IDEQ, USEPA | 2004-2005 | In 2004 USEPA initiated the remedial design for this site for implementation of an interim action by the State of Idaho during the summer of 2005. The overall site remedy construction is scheduled to begin in the summer of 2006. |
| Coeur d'Alene Mine and Mill | Coeur Silver Valley | 2001- | Prior to demolition, all salvageable metal materials were removed, decontaminated and taken offsite. The mill building was pulled apart using an excavator. A few large timbers were decontaminated and saved. The remainder of the demolition materials, primarily wood, was fed into a chipper which reduced volume by 90 percent. Once mill building was removed, the foundation and ore bins were cleaned. Fencing at the site was repaired and improved. Large boulders were placed at selected potential access points. Signs were placed at appropriate locations. |

**Table 6-10. Summary Activities and Remedial Actions – Operable Unit 3**

| Activity or Remedial Action | Responsible Entity | Dates | Description of Activity or Remedial Action |
|---|---|---|---|
| Silver Summit Mill | Sunshine Mining Company | 2001 | Labeled and removed all containers of solvents, lubricants, processing chemicals, paint and trash. A PCB investigation was conducted for all transformers and oil switches located throughout the site and none was found. Access controls were established. |
| Big Creek Repository | IDEQ, USEPA | 2002-Present | Established repository on former Sunshine Mining Co. tailings pond for contaminated soil and other materials removed during implementation of the remedial actions. |
| OU3 Basin Environmental Monitoring Plan (BEMP) | USEPA | 2004-Present | OU3-wide environmental monitoring plan designed to monitor and evaluate progress of remedy in terms of improving environmental conditions. Results available on www.storet.org. |
| Coeur d'Alene Lake | Coeur d'Alene Tribe, IDEQ | 2002-Present | Fish consumption study, preparation of Lake Management Plan (LMP) implementation of Lake Environmental Monitoring Plan (LEMP). |

**Table 6-11. Summary of Issues - Operable Unit 3 Remedial Actions**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | **Current (now to 1 year)** | **Future (>1 year)** |
| **Institutional Controls Program (ICP):** An OU3 ICP has not yet been established and remedial actions are being implemented. | Y | Y |
| **Residential and Common Use Remediation:** | | |
| **Lead Health Intervention Program (LHIP):** Funding for this program has been discontinued by ATSDR. The IDEQ funded LHIP activities in 2004. Annual blood lead screening participation rates have declined in the last three years. | N | Y |
| **Infrastructure:** Infrastructure upgrades and maintenance are critical to long-term remedy success. Resources to repair and install infrastructure that will help prevent recontamination of protective barriers need to be identified. State and federal governments will need to assist with the identification of resources. | Y | Y |
| **Migratory Songbird Study** | | |
| **Data Gaps:** Did not assess areas with soil concentrations less than 1,100 mg/kg (dw) and so potential adverse effects on songbirds is not known when the songbirds are inhabiting areas with soil lead less than 1,100 mg/kg (dw). | N | N |
| **Sub-lethal Effects:** Impact of sub-lethal effects on songbirds is unclear. | N | N |
| **Population-level Impacts:** Did not assess potential population-level impacts, particularly at areas where might expect clinical effects on individual songbirds (e.g., Cataldo, Strobl based on liver lead concentrations in song sparrows). | N | N |
| **Canyon Creek Water Treatment Pilot Study** | | |
| **Treatment Technologies:** Need to identify treatment technologies that will meet the goals of the 2002 OU3 ROD at the lowest possible long-term operation and maintenance (O&M) cost. | Y | Y |
| **Agriculture to Wetlands** | | |
| **Identify Landowners:** Need to identify landowners interested in agricultural to wetland conversion. | N | Y |

**Table 6-11. Summary of Issues - Operable Unit 3 Remedial Actions**

| Issues | Affects Protectiveness (Y/N) | |
|---|---|---|
| | Current (now to 1 year) | Future (>1 year) |
| **Soil Amendment Study**<br><br>**Further Study:** Further study is needed to resolve questions concerning optimal application rates, long-term stability, ecological impacts, and potential seasonal effects. | N | N |
| **Repository**<br><br>**New Sites:** Need for additional repository space. | N | Y |
| **Coeur d'Alene Lake**<br><br>**Lake Eutrophication:** Control of lake eutrophication and potential release of metals from contaminated sediments. | Y | Y |

**Table 6-12. Summary of Recommendations and Follow-up Actions – Operable Unit 3 Remedial Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) Current (now to 1 yr) | Follow-up Actions: Affects Protectiveness (Y/N) Future (> 1 year) |
|---|---|---|---|---|---|
| **Secure Funding for Full Implementation of Interim OU3 Remedy**<br>EPA Region 10 has received funding for implementation of the OU3 human health remedy. The Region will continue to work with EPA Headquarters and other parties to secure funding for full implementation of the 2002 OU3 ROD. | USEPA | USEPA | Ongoing | Y | Y |
| **Institutional Controls Program (ICP)** | | | | | |
| Establish an OU3 ICP as soon as possible to protect barriers from disturbance and minimize recontamination. | IDEQ, PHD, USEPA | USEPA | 12/2006 | Y | Y |
| **Health and Safety During Remediations** | | | | | |
| Continue successful implementation of safety programs as evidenced by no lost time or injuries reported. | IDEQ, USEPA | USEPA | Ongoing | Y | Y |
| **Residential and Community Area Remediation** | | | | | |
| **Human Health Exposure Profile:** Complete an updated exposure profile for OU3. | IDEQ, USEPA | USEPA | 12/2006 | N | Y |
| **Implement Actions:** Continue to implement remedial actions. | IDEQ | USEPA | 12/2009 | Y | Y |
| **Lead Health Intervention Program (LHIP):** Identify additional funding sources for the LHIP. Continue to evaluate options for increasing participation in annual blood lead screening program. | IDEQ, PHD, USEPA | USEPA | 12/2005 | N | Y |
| **Infrastructure:** Work with Basin communities and state and federal agencies on an infrastructure plan to ensure remedy success. | IDEQ | PHD, USEPA | 12/2008 | Y | Y |
| **Coeur d'Alene Lake Fish Investigation** | | | | | |
| **Future Sampling:** Evaluate the need for additional fish tissue sampling and testing in Coeur d'Alene Lake to assess the applicability of the current fish consumption advisory. | Coeur d'Alene Tribe and State of Idaho | Coeur d'Alene Tribe and State of Idaho | 9/2010 | N | Y |

**Table 6-12. Summary of Recommendations and Follow-up Actions – Operable Unit 3 Remedial Actions**

| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Follow-up Actions: Affects Protectiveness (Y/N) Current (now to 1 yr) | Follow-up Actions: Affects Protectiveness (Y/N) Future (> 1 year) |
|---|---|---|---|---|---|
| **Lower Basin Recreational Areas** | | | | | |
| **Remedial Action Effectiveness Monitoring**: Implement remedial action effectiveness monitoring programs at the East of Rose Lake Boat Launch and the Highway 3/Trail of the Coeur d'Alenes crossing sites. | USEPA | USEPA | Ongoing | N | N |
| **East of Rose Lake Boat Launch:** Continue remedial action effectiveness monitoring. | USEPA | USEPA | 9/2010 | N | Y |
| **Highway 3/Trail of the Coeur d'Alenes Crossing:** Continue remedial action effectiveness monitoring. | USEPA | USEPA | 9/2010 | N | Y |
| **Informational Signage:** Replace damaged signs as needed. | USEPA | USEPA | Ongoing | N | N |
| **Additional Areas:** Identify and evaluate additional Lower Basin recreational areas that may require cleanup. | USEPA | USEPA | Ongoing | N | N |
| **Migratory Songbird Study** | | | | | |
| **Risk Analysis:** *Conduct a risk analysis with data generated from* the migratory songbird study, and assess any data gaps identified. | USEPA | USEPA | 9/2010 | N | Y |
| **Survey and MAPS:** Continue the Breeding Bird Survey and MAPS route through the Lower Coeur d'Alene River Basin to determine bird diversity. Assist managers in riparian habitat remedial decisions. | USEPA | USEPA | Ongoing | N | Y |
| **Canyon Creek Water Treatment Pilot Study** | | | | | |
| **Treatment Technologies:** Complete pilot studies to evaluate active and passive technologies to achieve the goals of the 2002 OU3 ROD. | USEPA | USEPA | Ongoing | Y | Y |
| **Agricultural to Wetland Conversions** | | | | | |
| **Identify Landowners**: Identify landowners interested in agricultural to wetland conversion. | USEPA | USEPA | Ongoing | N | Y |
| **Soil Amendment Study** | | | | | |

| Table 6-12. Summary of Recommendations and Follow-up Actions – Operable Unit 3 Remedial Actions | | | | | |
|---|---|---|---|---|---|
| | | | | Follow-up Actions: Affects Protectiveness (Y/N) | |
| Recommendations/Follow-up Actions | Party Responsible | Oversight Agency | Proposed Milestone Date | Current (now to 1 yr) | Future (> 1 year) |
| **Further Studies**: Evaluate findings of follow-up study and, as appropriate, conduct further evaluations of technical feasibility of soil amendments. | IDEQ, USEPA | USEPA | 9/2010 | N | N |
| **Silver Dollar Growth Media Pilot** | | | | | |
| **Further Monitoring:** Continue annual monitoring and use results to help develop vegetative covers for future remedial actions. | IDEQ | IDEQ | Ongoing | N | N |
| **Upper Basin Mine and Mill Sites** | | | | | |
| Complete remedial designs (RDs) at Rex and Golconda sites. Initiate construction of the remedy at Constitution, Rex, and the Golconda. Identify additional Mine and Mill sites to begin RD. | BLM , IDEQ, USEPA | BLM, USEPA, IDEQ | RD completion at 2 sites 9/2005. RA start at 2 sites 10/2005 | N | Y |
| **Repositories** | | | | | |
| **Big Creek:** Continue to implement remedial actions at Big Creek Repository. | IDEQ , USEPA | IDEQ, USEPA | 9/2010 | N | Y |
| **New Sites**: Continue search and evaluation of potential repository sites. | IDEQ, USEPA | IDEQ, USEPA | 9/2007 | N | Y |
| **OU3 Basin Environmental Monitoring Plan (BEMP)** | | | | | |
| Continue to implement the BEMP. | USEPA | USEPA | Ongoing | N | Y |
| **Remedial Action Effectiveness Monitoring** | | | | | |
| Continue implementation of remedial action effectiveness monitoring at recreational areas and include RA effectiveness monitoring in the designs and implementation plans for ecological-related remedial actions. | USEPA and/or implementing entity | USEPA | Ongoing | N | N |
| **Coeur d'Alene Lake** | | | | | |
| **Lake Eutrophication:** Complete Lake model. | Coeur d'Alene Tribe, USGS | USEPA | 12/2006 | Y | Y |
| **Lake Management Plan:** Complete and initiate Lake Management Plan. | Coeur d'Alene Tribe, IDEQ | USEPA | 4/2006 | N | Y |

# 7 Statement of Protectiveness

## 7.1 Operable Unit 1

The remedy being implemented in Operable Unit 1 (OU1) is expected to be protective of human health and the environment upon completion, provided that follow-up actions identified in Table 6-3 are implemented.

Although the remedy has not been fully implemented, environmental data (except right-of-way [ROW] data) indicate that the remedy is functioning as intended by the Record of Decision (ROD). As remediation nears completion, soil and house dust lead concentrations are declining, lead intake rates have been substantially reduced, and blood lead levels have achieved their remedial action objectives (RAOs). House dust lead levels are declining but some individual homes continue to exceed lead concentrations of 1,000 milligrams per kilogram (mg/kg). For ROWs, data indicate that lead levels are stabilizing but are continuing to slowly increase over time.

There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy; however, due to the history of flooding in the area, it is possible that future flood events may affect remedy protectiveness. In addition, the ability of the local communities to improve and maintain infrastructure to protect the remedy is a concern. Infrastructure improvements and ROW recontamination will be evaluated in the next five-year review, as well as determining whether all the RAOs have been met once the remedy is completed.

## 7.2 Operable Unit 2

The remedy being implemented in Operable Unit 2 (OU2) is expected to be protective of human health and the environment upon completion, and in the interim, human health exposure pathways that could result in unacceptable risks are being controlled.

In 1995, with the bankruptcy of the Site's major Potentially Responsible Party (PRP), the USEPA and the State of Idaho defined a path forward for phased remedy implementation in OU2. Phase I of remedy implementation includes extensive source removal and stabilization efforts, all demolition activities, all community development initiatives, development and initiation of an Institutional Controls Program (ICP), future land use development support, and public health response actions. Also included in Phase I are additional investigations to provide the necessary information to resolve long-term water quality issues, including technology assessments and pilot studies, evaluation of the success of source control efforts, development of site-specific water quality and effluent-limiting performance standards, and development of a defined operation and maintenance (O&M) plan and implementation schedule. Interim control and treatment of contaminated water and acid mine drainage (AMD) is also included in Phase I of remedy implementation.

Phase I remediation began in 1995, and source control and removal activities are near completion.

Since beginning the implementation of Phase I in 1995, a significant amount of remediation work has been conducted. As summarized in Table 4-1 of this report, over 3.3 million cubic yards of contaminated waste have been removed and consolidated onsite in engineered closure areas (the Smelter and Central Impoundment Area Closures). The use of geomembrane cover systems on these closure areas effectively removes these contaminated wastes from direct contact by humans and biological receptors. Consolidating these wastes in engineered closures also substantially reduces the exposure pathway to the surface water and groundwater environment in comparison to pre-remediation site conditions.

Also, as summarized in Table 4-1, over 800 acres of property within OU2 have been capped to eliminate direct contact with residual contamination that remains in place within some areas of OU2. In addition, the revegetation work conducted as part of the Phase I remedial actions has substantially controlled erosion and has significantly improved the visual aesthetics of OU2. The success of the Phase I revegetation efforts is providing improved habitat for wildlife that was largely absent for decades in many areas of the hillsides and Smelterville Flats.

All of these efforts have reduced or eliminated the potential for humans to have direct contact with soil/source contaminants, have reduced opportunities for transport of contaminants by surface water and air, and are expected to provide surface and groundwater quality improvements over time throughout the Site.

Phase II of the OU2 remedy will be implemented following completion of source control and removal activities and evaluation of the impacts of these activities on meeting water quality improvement objectives. Phase II will consider any shortcomings encountered in implementing Phase I and will specifically address long-term water quality and environmental management issues. In addition, the ICP and future development programs will be reevaluated as part of Phase II.

The effectiveness evaluation of the Phase I source control and removal activities to meet the water quality improvement objectives of the 1992 OU2 ROD will be used to determine appropriate Phase II implementation strategies and actions. In addition, although the 1992 OU2 ROD goals did not include protection of ecological receptors, additional actions may be considered within the context of site-wide ecological cleanup goals. Both ROD and SSC amendments are required prior to implementation of Phase II remedial actions.

In addition to evaluating Phase I actions and identifying possible Phase II actions, a State Superfund Contract (SSC) amendment that allows for the full implementation of the 2001 OU2 ROD Amendment needs to be negotiated and signed. Time-critical components of this ROD amendment were implemented to prevent catastrophic failure of the Central Treatment Plant (CTP) and discharges of AMD to Bunker Creek and the South Fork of the Coeur d'Alene River. Until an SSC is signed, however, control and treatment of AMD and its impact on water quality will continue to be an issue. The USEPA and the State of Idaho continue to discuss the SSC amendment and the long-term obligations associated with the mine water remedy.

## 7.3 Operable Unit 3

The Operable Unit 3 (OU3) ROD is a 30-year cleanup plan that was published by the USEPA in September 2002. Therefore, remedy implementation has been ongoing for approximately 3 years and a protectiveness determination of the OU3 remedy cannot be made until further information is obtained. This additional information will be collected during the implementation of the remedy and through the completion of studies that support the remedy. For the human health remedy being implemented in the OU3 residential and community areas, including identified recreational areas, the remedy is expected to be protective of human health and the environment upon completion. In the interim, exposure pathways that could result in unacceptable risks are being controlled. OU3 ecological remedial actions have not yet been implemented. Protectiveness of the OU3 remedy will be evaluated in the next five-year review.

# 8 Next Five-Year Review

The USEPA is required by statute (Comprehensive Environmental Response, Compensation, and Liability Act) to conduct remedy reviews every 5 years at Superfund sites where hazardous substances remain onsite above levels that allow for unlimited use and unrestricted exposure. The trigger date for completion of these reviews is 5 years after initiation of the first remedial action at the Site. The first remedial action at the Bunker Hill Superfund Site started in 1995. Since onsite containment of hazardous substances is part of the Site's Selected Remedy, the first five-year review was completed on September 27, 2000. This second five-year review and report was required to be completed by September 27, 2005; however, due to the 30-day extension of the public comment period, the final report was delayed by approximately one month.

The next review (the third five-year review) of the Bunker Hill Superfund Site will be conducted within 5 years of the completion date of this second, five-year review report. The third five-year review report will cover all remedial work, monitoring, and operation and maintenance activities conducted at the Site. In addition, as stated in the 2002 Operable Unit 3 Record of Decision, the USEPA will continue to evaluate Coeur d'Alene Lake conditions in the next and future five-year reviews.

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# Appendix A

**Second Five-Year Review**
Bunker Hill Mining and Metallurgical Complex Superfund Site
Operable Units 1, 2, and 3
Idaho and Washington

# *Responsiveness Summary*

# Contents



**Tables**

# 1 Introduction

The purpose of this Responsiveness Summary is to present the U.S. Environmental Protection Agency's (USEPA's) response to public comments on the Second Five-Year Review for the Bunker Hill Mining and Metallurgical Complex Superfund Site, Operable Units 1, 2, and 3. While a public comment period is not required for five-year reviews, the USEPA felt strongly that given the strong amount of public and stakeholder interest in the site, a public comment period was warranted.

This Responsiveness Summary consists of two sections, as follows:

- **Section 1—Introduction:** This section provides an overview of the public comment history and process
- **Section 2—Comments and Responses:** Provides an overview of the written comments received from the public and various stakeholder groups during the June - July 2005 Public Comment Review of the Draft Five-Year Review Report.

Reproduction of the written comments received pared with the USEPA's comment-by-comment responses are not available as an attachment to the hard copy of the final report. It is available, however, by one of the following means:

- Visit the USEPA Region 10 website: http://yosemite.epa.gov/r10/cleanup.nsf/bh/five+year+reviews
- Call 1-800-424-2709 to order a hard copy, or
- Visit one of the Site's eight information repositories listed below:

USEPA Seattle Office
Superfund Records Center
1200 Sixth Avenue
Seattle, WA 98101
206-553-4494

Pinehurst Kingston Library
107 Main Avenue
Pinehurst, ID 83850
208-682-3483

Kellogg Public Library
16 West Market Avenue
Kellogg, ID 83827
208-786-7231

Coeur d'Alene Field Office, USEPA
1910 Northwest Boulevard, Suite 208
Coeur d'Alene, ID 83814
208-664-4588

Wallace Public Library
415 River Street
Wallace, ID 83873
208-752-4571

Harrison City Hall
100 Frederick Avenue
Harrison, ID 83833
208-689-3212

North Idaho College Library
1000 Garden Avenue
Coeur d'Alene, ID 83814
208-769-3355

Spokane Public Library
906 West Main Avenue
Spokane, WA 99201-0976
509-444-5336 for reference desk – ask for Dana Dalrymple

## 1.1 Overview

Public comment periods are not required for five-year review documents. However, the USEPA elected to provide the public and stakeholders an opportunity to comment on this five-year review report given the strong public and stakeholder interest regarding the Bunker Hill Site. The original public comment period was a 30-day period extending from June 1 to June 30, 2005. Two requests for an extension to the public comment period were received by the USEPA during the public comment period. In response, the USEPA granted a 30-day extension to the public comment period extending the end date to July 30, 2005.

The USEPA has provided venues for public comment throughout the five-year review process. Notification that the USEPA was conducting a site-wide five-year review began in the summer of 2004, followed by periodic updates on the progress of the review and opportunities for public input. Public notification was accomplished through fact sheets, the Coeur d'Alene *Basin Bulletin*, and the USEPA Region 10 website. Direct notification was accomplished via letters, e-mails, and presentations to a number of organizations. Telephone interviews were conducted with county council chairs and with the mayors of the cities and towns within the Bunker Hill Site. During the public comment period, open houses were held at five locations throughout the Coeur d'Alene Basin. The open houses provided opportunities to talk with the USEPA and State of Idaho staff about the five-year review. Forty-five people attended these open houses.

# 2 Comments and Responses

## 2.1 Number and Type of Comments Received

In addition to Comment Period Extension Request Letters from HellerEhrman and the Idaho Congressional Delegation, the following 19 individuals or entities submitted comments.

- Coeur d'Alene Tribe
- (b) (6)
- A mother
- (b) (6)
- (b) (6)
- (b) (6)
- (b) (6)
- Department of the Interior
- (b) (6)
- (b) (6)
- Terry Harwood, Basin Commission Executive Director
- HellerEhrman (Hecla)
- Mike Mihelich, Kootenai Environmental Alliance
- (b) (6)
- Panhandle Health District
- (b) (6)
- Sierra Club
- Paul Woods, USGS Water Resources
- Joyce Broadsword, State Government
- (b) (6)
- (b) (6)

The authors of comment submittals were organized into the commenter types listed in Table 2-1, which presents the numbers of comment submittals by each commenter type.

**TABLE 2-1**

**Number of Total Comment Documents Received, Listed by Commenter Type**

| Commenter Type | Number of Comment Submittals |
|---|---|
| State Agencies | 3 |
| Groups | 2 |
| Cards | 6 |
| Federal Agencies | 3 |
| Mining Company Representatives | 1 |
| County Agencies | 1 |
| Citizens | 5 |
| **TOTAL** | **21** |

Individual comments within each submittal were marked and assigned to a specific category (General or OU) and subcategory as shown in Table 2-2. Table 2-2 also lists the number of comments received for each subcategory. Within the 21 comment submittals, 193 separate comments were identified.

**TABLE 2-2**
**Categories and Subcategories Applied to Comments**

| Comment Category | Comment Subcategory | Number of Comments |
|---|---|---|
| General | Subcategory for General | 36 |
| OU1 | Blood Lead | 5 |
| OU1 | Human Health | 1 |
| OU1 | OU1 ICP | 2 |
| OU1 | OU1 Right of Ways | 1 |
| OU1 | Recontamination | 1 |
| OU1 | Yard Cleanups | 3 |
| OU2 | Biological Resources | 1 |
| OU2 | Groundwater | 1 |
| OU2 | Mine Water | 5 |
| OU2 | OU2 General | 4 |
| OU2 | OU2 ICP | 4 |
| OU2 | Phase I Remedial Actions | 21 |
| OU2 | Recreational (UPRR) | 6 |
| OU2 | Surface Water | 1 |
| OU3 | ARARs | 3 |
| OU3 | Basin Commission | 1 |
| OU3 | Biological Resources | 1 |
| OU3 | Coeur d' Alene Lake | 23 |
| OU3 | Human Health | 4 |
| OU3 | Human Health-Recreational | 7 |
| OU3 | Human Health-Residential | 6 |
| OU3 | Human Health-Trail of the Coeur d' Alenes | 26 |
| OU3 | Mine and Mill Sites | 21 |
| OU3 | OU3 General | 14 |
| OU3 | OU3 ICP | 7 |
| OU3 | Recontamination | 1 |
| OU3 | Repositories | 5 |
| OU3 | STORET | 1 |
| OU3 | Surface Water | 3 |
| OU3 | Surface Water-Monitoring | 2 |
| OU3 | Surface Water-Water Treatment | 3 |

## 2.2 Responses to Comments

As stated earlier, reproduction of the written comments received paired with the USEPA's comment-by-comment responses is not available as an attachment to the hard copy of the final report. It is available, however, by visiting the EPA Region 10 website or one of the Site's eight information repositories or by requesting a hard copy from EPA Region 10.

On the CD-ROM copy, Attachment 1 presents copies of the comment submittals received during the public comment period and the USEPA's responses to those comments. Letters, cards, faxes, and e-mails are reproduced and paired with the USEPA's responses.